APRIL 1957

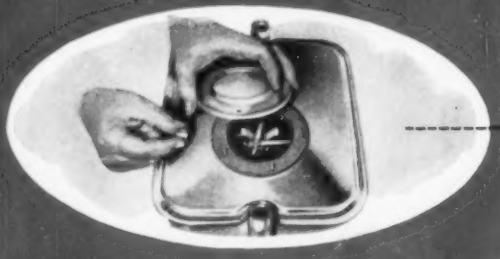
GAS

ANNUAL ISSUE
HIGHLIGHTING
DISTRIBUTION OPERATIONS

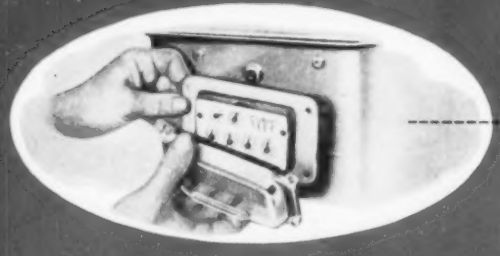
A CHILTON PUBLICATION

ENGINEERING • UTILIZATION • PIPELINES • MANAGEMENT

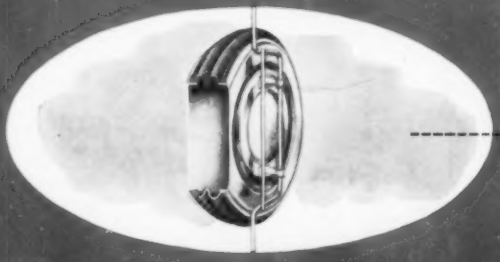
New Advanced Design AMERICAN® "W" Series Steelcase Meters



Hardcase meter accessibility through easily opened handhole.



Interchangeable Index—external and isolated from pressure with gas-tight frictionless rubber grommet drive-shaft seal.



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And every American meter refinement developed in 120 years of meter engineering.

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W-75 Rated Capacity 75cfh FOB Philadelphia, W-45-LPG Rated Capacity 45*cfh FOB Philadelphia, W-175 Rated Capacity 175cfh FOB Fullerton, Calif., W-210 Rated Capacity 210cfh FOB Philadelphia, W-250 Rated Capacity 250cfh FOB Philadelphia, W-300 Rated Capacity 300cfh FOB Philadelphia.

*Propane.
Rated capacities based on 0.64 sp. gr. gas at ½-inch pressure drop — 5 psi working pressure.

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For 35 years the Cutler-Hammer Recording Calorimeter has been the "silent sentinel" guarding profits for the nation's gas transmission industry. Day in and day out, with *guaranteed* accuracy, hundreds of these dependable instruments have been revealing and recording the Btu content per standard cubic foot . . . regardless of pressure, temperature and flow variables.

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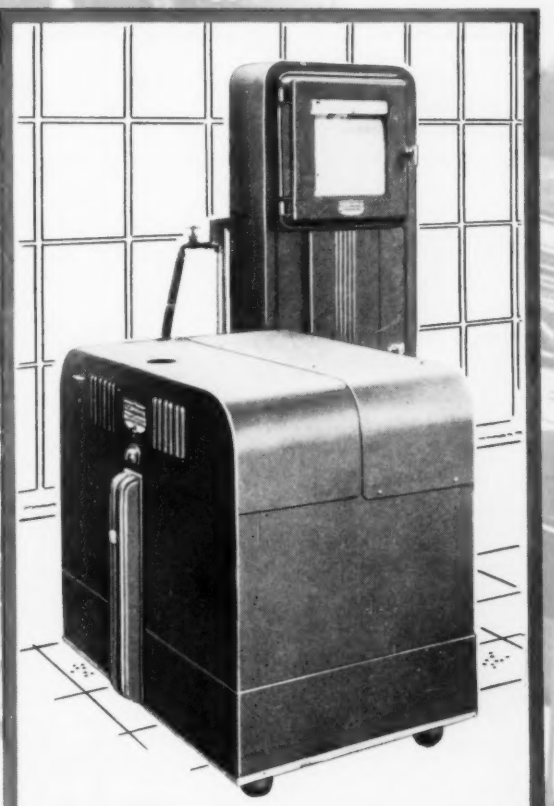

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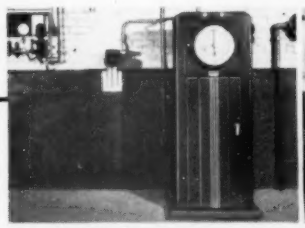
TEXAS EASTERN TRANSMISSION CORPORATION



C-H Calorimixers automatically mix two or more high or low pressure gases of variable heating value in any volume, holding the final product to a constant heating value.

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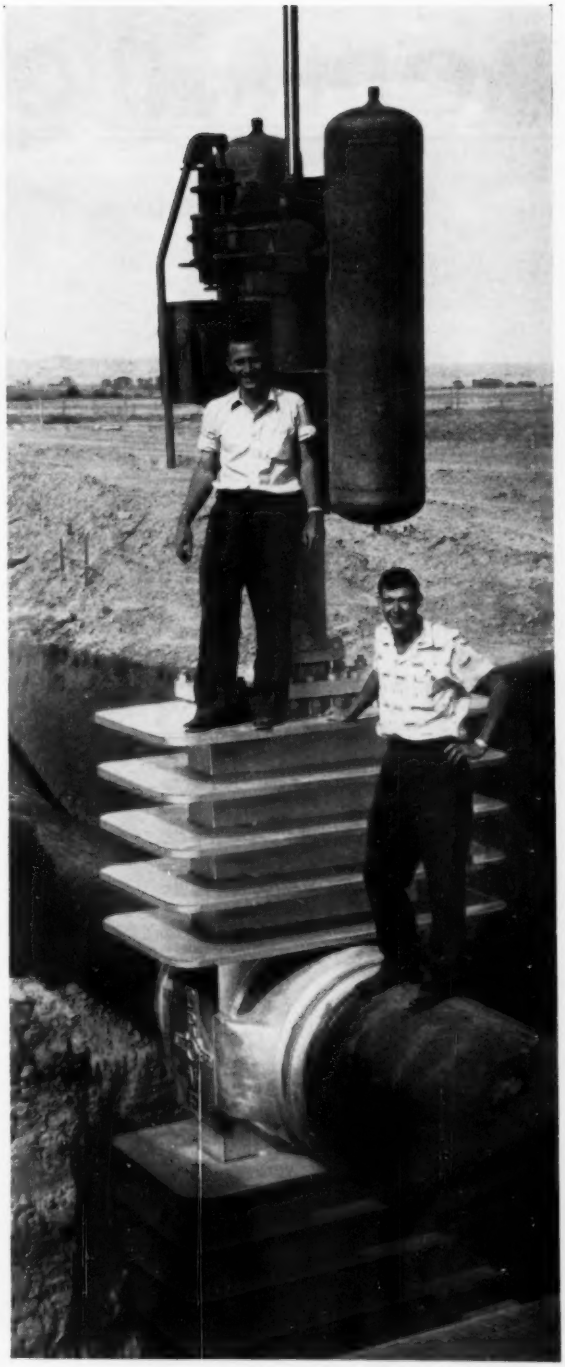
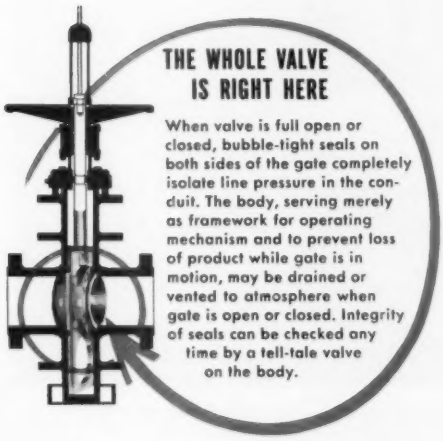
widely varying demands.

BIG LINES take BIG VALVES



This 34" ASA-400 full opening high pressure Grove *Seal-O-Ring* Gate Valve with the fabricated steel body is one of a series already in service on one of the nation's major gas pipelines. Its huge free-sliding non-wedging gate is actuated by a hydraulic piston operating on pressure from the line. Grove *Seal-O-Ring* Gate Valves – now thoroughly proved in the field – are available from 2" to 36" in all standard pipeline pressures for gas or liquid service.



THE WHOLE VALVE IS RIGHT HERE

When valve is full open or closed, bubble-tight seals on both sides of the gate completely isolate line pressure in the conduit. The body, serving merely as framework for operating mechanism and to prevent loss of product while gate is in motion, may be drained or vented to atmosphere when gate is open or closed. Integrity of seals can be checked any time by a tell-tale valve on the body.

701

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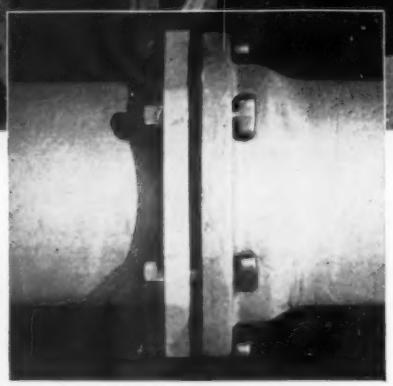
MODERN GAS SYSTEMS



Modernized 12" mechanical joint cast iron pipe being unloaded by the Public Service Electric and Gas Company of Newark, N. J.

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Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, 122 So. Michigan Ave., Chicago 3, Ill.

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Modernized cast iron pipe, centrifugally cast, is even tougher, stronger, more efficient. Its standardized mechanical joints are bottle-tight under all gas pressures . . . and for all types of gas.

Wall thicknesses are uniform. Joint design allows deflection during and after installation. Service connections are easily made. Shorter lengths and ample variety of standard fittings cut time and labor in congested undergrounds.

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105 Years Old . . . and Still Going Strong!
Installed in 1852 this cast iron pipe still distributes gas for the Providence Gas Company, Providence, R. I.
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pipe FOR MODERN GAS DISTRIBUTION

GAS Thermally Thinking

Crossroads for air conditioning

THE domestic air conditioning era is here. With it, the gas industry entered an era that produced the first serious threat to the SPACE HEATING load.

Units designed for just cooling-conditioning air in the summer simply bridge the gap between the un-air-conditioned and the air-conditioned eras. Domestic air conditioning means conditioning heated and cooled air for dwellings. So, when an air-conditioning unit powered with energy other than gas is installed in your service area, there goes some of the space heating load.

Is your company protecting its space heating load by realistically "selling" summer-winter, gas-powered air conditioning? Too many will have to answer "no."

Let's set aside the past and the negative. Profit from experiences, yes, but concentrate on the future. A "crash" program is needed. The program must:

(1) Bring all-out, industry-wide ACTION into promoting and selling "air conditioned by gas."

(2) Get completely and unquestionably behind manufacturers of gas-powered air conditioners. Remember, we do not have a G.E. in this group making such units. Help them—even financially—with production, distribution and marketing problems on current models.

(3) Develop and produce a gas-powered air conditioner that has all of the characteristics needed by not later than spring of 1958.

What the gas industry needs in the way of an air conditioning unit is:

(1) One with an initial cost equal to or not over a couple of hundred dollars more than competitive machines.

(2) More sizes with adequate increments between 1 and 10 tons for refrigeration and without need for auxiliary strip or duct heaters.

(3) An air-cooled system that will eliminate need for an evaporative water cooler.

(4) An appliance with relatively small physical dimensions so it can be ideally specified for new homes, and installed in existing homes without major remodeling.

Immediate ACTION will be late, but not too late.

J. Fred Ebdon

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GAS highlights

SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

APRIL 1957

Automatic ignition became mandatory for AGA approval on commercial ovens and deep fat fryers, Jan. 1, 1957. Checks with distribution companies show that the action was well received. It improved utility-dealer-customer relationships in the commercial field. Gas company training programs for control servicing helped some plumbers and dealers' servicemen learn the individually designed controls prior to going to a customer's installation for service. Gas utilities' servicemen were up-to-date from experience with control systems on other gas appliances in the domestic and commercial fields.

AGA reports that 251 new municipally owned gas distribution systems have turned up since 1950. However, investor-owned gas utilities serve 94 per cent of our 30 million customers, and they are still adding more. Growth of public-ownership gas companies is heavy in towns under 10,000 people.

Down in Dallas, one of the world's largest commercial developments will be heated, air conditioned and furnished hot-water service from natural gas energy. Exchange Park—a cluster of multi-storied office, medical and hotel buildings—will be served by a six-story power plant. Steam generated from natural gas-fired boiler will initially drive three steam turbines to produce 1000 tons of refrigeration for the air conditioning system. About 13,000 tons of refrigeration will be required at the end of committed construction plans. The project is developing so fast it is hard to keep up with "the latest." Lone Star Gas Co. (Dallas) laid 2000 ft of 12-in. main to supply the initial load of 23 Mcf/hr. Design is for 310 Mcf/hr or 556 MMcf/yr. It is the largest air conditioning plant under one roof. Even the covered passageways between buildings will be completely air conditioned. It's a fantastic integrated commercial development by anybody's measure. Lone Star has been cooperatively working with the developers for over four years.

Distribution companies are watching as FPC and Phillips Petroleum run headlong into rate-base type price regulation for natural gas producers. This is the first time a producer has exhibited to FPC details of its production costs. It looks like these cost data will not support lower field prices consumers expect from applying utility-style regulation. This case can set the pace for field pricing, particularly in the absence of legislation.

Investor's confidence in gas distribution companies has been strong in spite of recent market softness. Extremely gratifying case in point, was a positive response to Northern Illinois Gas Co.'s "buy or sell" plan. Purpose: get stockholders with under 10 shares to round-up to 10 or sell out. About 15,500 investors elected to go up to 10 shares while 5900 decided to sell.

FCC is expected to start oral hearings in the important microwave hearing (Docket 11866) in early May, rather than in the first part of April.

British Columbia Electric Co. (Vancouver) may use electric conduit to "cable" natural gas 22.3 miles underwater from the mainland to Vancouver Island. Non-affiliated Magna Pipeline Co. Ltd. would engineer and construct the new concept for pipelining, if the idea goes through.

Neil Regeimbal reports from Washington that Rep. Bennett (R.-Mich.) has suggested legislation to create an REA-type outfit that would finance cooperatives to build natural gas pipelines into communities that want gas service. Rep. Bennett says he's "at least partly" serious, but hasn't decided between REA for pipelines, or simply a bill to give FPC power to order pipeline extensions "where feasible." Washington isn't taking the matter very seriously.

Texas Gas Transmission's quiet-spoken, able President, W. T. Stevenson recently told a group of California financial analysts, ". . . I believe that we have reached a plateau around the 20-cent level, excluding taxes, at which the field price (for natural gas. Ed.) will stay rather constant for a considerable period of time, except, of course, for general inflation of our whole economy. This probably would have been true with or without regulation, and regardless of the effect of any pending legislation to free the producer from utility-type of regulation, as recommended by Mr. Eisenhower in his recent budget speech. This leveling off of the field price for gas should play an important part in eliminating any feeling of instability in our industry that may exist in the minds of the investing public." Mr. Stevenson also said he sincerely feels the honest lack of understanding between production, pipeline and distribution groups, which was the Harris Bill's principal problem, has been removed and these groups now understand the others' positions much better.

Two electric utilities in Florida have accepted all rate conditions necessary to clear the way for the $150-million Houston Gas-Coastal Transmission pipeline project which will bring the first statewide natural gas service to Florida. Looks like construction will start this summer and natural gas service will begin next year.

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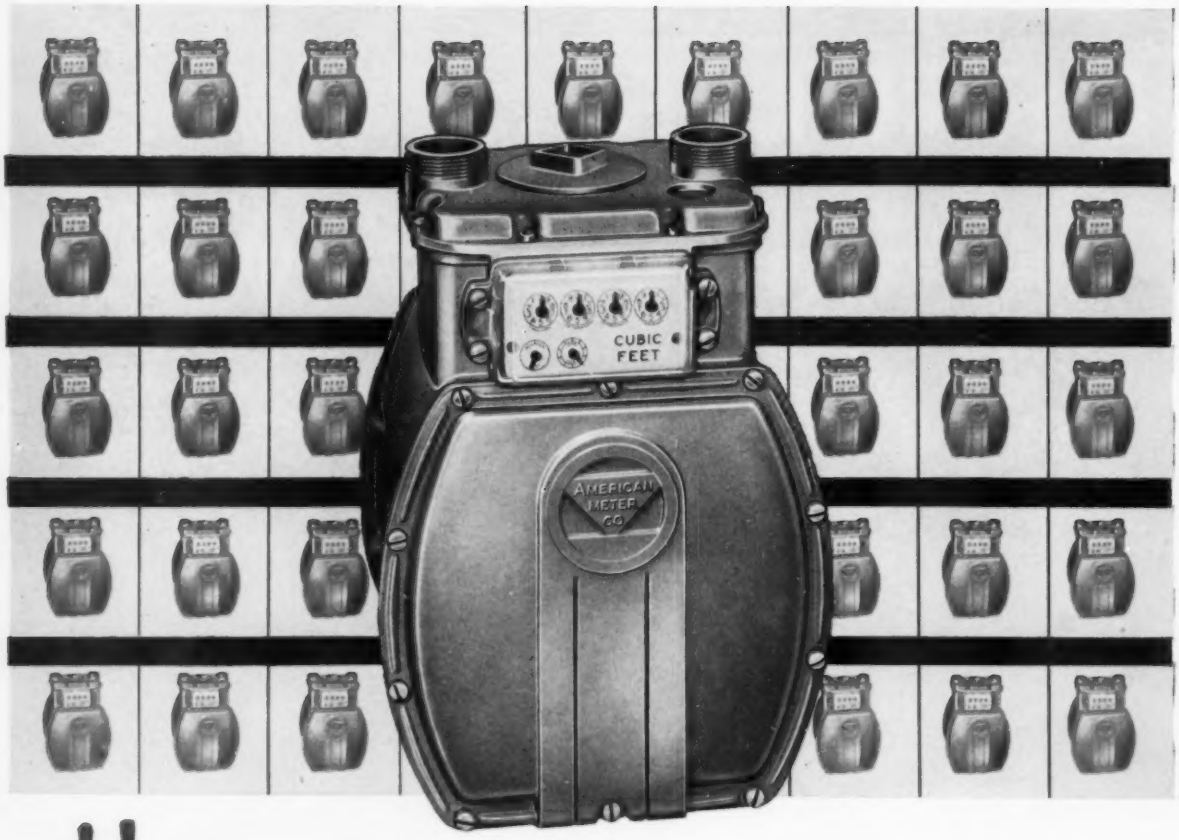

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*regulatory and legislative trends

California's radio decision awakens the nation

THE California Public Utilities Commission recently rendered a far-reaching decision approving the lease-maintenance service offered by the Bell Telephone System to private licensees for mobile radio. Many persons concerned with radio communications in the oil and gas industries have been watching the test case in California from the four corners of the nation.

There were numerous protestants to Pacific Telephone Co.'s proposal to render radio lease-maintenance service to all applicants under a price schedule filed with the commission. Many were private businessmen, who were competing with the telephone company in furnishing radio equipment and maintaining it for operation by FCC licensees on assigned frequencies. Those businessmen were relieved when the commission found that they should not be regulated as public utilities, because they had not dedicated private mobile radio systems to every member of the public who requested lease-maintenance service. Those operators reserved the right to refuse service to anyone they pleased. Freedom from regulation as a public utility was sweet radio music to those small businessmen, even though competition by the telephone company will increase.

The commission concluded that the telephone company's offering of private mobile radio telephone systems to all eligible members of the public on a lease and maintenance basis would be a convenient utility service and would not interfere unreasonably with its main function of rendering telephone service to millions.

In addition to offering radio equipment at stated prices, the telephone company's tariff provides that the radio station licensee will be responsible for securing the necessary authorizations for the communications system and for radio operators from FCC. Such service will be furnished to organizations licensed by FCC in maritime, aviation, public safety, industrial, land transportation and citizens radio services. The rate schedule provides that the radio station licensee shall have exclusive control of the communication facilities and shall have full responsibility for their use and operation in accordance with FCC rules.

Many important issues were decided by the California commission, so let us brief them.

Public utility service in radio

The commission analyzed the many contentions such as:

"Another party stated these activities are not telephone service, but are equipment service, and the mere leasing, installation or maintenance of radio equipment for private mobile radio or any combination of these activities, without the ability to furnish the channel upon which such equipment is used, bear no indicia of the monopoly characteristics of telephone service. Quite the contrary, he states, the leasing, installation and maintenance of equipment for private mobile radio is in fact a highly competitive industry in which over 100 persons are directly engaged in the state of California alone.

"Pacific advanced a different view, stating there is nothing unusual in the fact that regulated public utilities and unregulated enterprises may be furnishing the same or a similar type of service in the same locality at the same time. In the absence of an exclusive franchise a public utility has no right to be free from competition; and by the same token it is fundamental to our competitive system that unregulated businesses have no right to freedom from competition, so states Pacific, and it cites two cases outside of California. Competition between municipal utilities not subject to the jurisdiction of this commission and public utilities in this state are not uncommon. Pacific indicates that dedication of its property to public service subjects it to commission regulation and states that by submitting to regulation of the commission it has voluntarily dedicated its private mobile facilities and business to a public use, citing several cases. In this connection it should be pointed out that the selection of the persons who fall within the portion of the public to which the service is offered will be made by the FCC and not Pacific."

The California commission concluded that:

"After studying the extensive record we find no reason to change our earlier view. Pacific is definitely a public utility under the California Constitution and the Public Utilities Code; it is not only willing now to dedicate its mobile communication property to the public service in private automobiles for private as well as public mobile communication service and to file tariffs as required by the Public Utilities Code, but we

* A monthly commentary on national and state developments by an expert in the field of utility law.

hereby find that it has in fact so dedicated its property and service.

"The commission finds that Pacific's offering in its proposed Schedule 108-T to furnish mobile communication equipment on a lease and maintenance basis without discrimination to persons authorized to operate private mobile communication systems is an offering of public utility service by a telephone corporation under the provisions of the California Constitution and the Public Utilities Code."

State jurisdiction

The California commission asserted jurisdiction over the telephone company's radio business and stated:

"The private mobile telephone communication with which we are here concerned involves communication between points within California. We have concluded that the rates to be charged by Pacific for its services in connection with such communication are subject to regulation by this commission. The federal law clearly does not preclude such regulation.

"Certain parties suggested that private mobile licensees obtaining their equipment from Pacific on a lease and maintenance basis do not have control of the equipment as required under the FCC rules. While most of the parties leasing equipment from Pacific preferred that the technical adjustment and maintenance be performed by Pacific's technicians, it appeared that technically these parties had control of the equipment. Even if they did not, that is a matter for the FCC to deal with and is not an issue within our province."

Unfair competition and the antitrust consent decree

Upon this contested fair trade issue the commission stated:

"A Congressman from California, appearing as the representative of Subcommittee 5 of the Small Business Committee of the House of Representatives, stated: 'It appears that the filing of tariffs definitely reflects unfair competition to the many small businessmen of our state.' He was familiar with the Consent Decree and continued: 'Under the Decree, the American Telephone and Telegraph Co., Western Electric and their subsidiaries are forbidden to engage in any business other than the furnishing of common carrier services, yet that term is defined in such manner that the small businessman in the private communication service will be afforded little actual protection.' He charged that the strategy is for the telephone companies, whose private communication services were not then subject to regulation, to file tariffs with the various state commissions in order to bring them within regulation and so exempt those operations from the prohibitions of the Decree." * * *

"There is a fear that the telephone company will use this service as an entering wedge to secure ultimate control over all wave lengths now devoted to private communications. But this can be done only by order of the FCC, which is charged, as truly as is this commission, with the duty of protecting the public interest. There is a fear that the applicant will get control of all the California mountaintops suitable for the location of base stations. Here again, if the danger should ever become acute there is public authority to deal with unfair business practices. There is a fear that this commission is being used to subvert the intent of the Consent Decree. But the federal court has continuing jurisdiction and does not need the offices of this commission either to interpret or to enforce its orders. There is fear that the competition of the telephone company will drive the smaller suppliers of this type of service out of business. Protestants' testimony on this score, however, shows some internal inconsistencies. On the grounds of preserving competition, they seek to bar a competitor from the field. In fearing the competition of Pacific, they assume that it will have insuperable competitive advantages; while, in discussing Pacific's motive in making this public offering, they emphasize the disadvantages which regulation involves.

"We are not convinced that Pacific's presence in the field will constitute any threat to the continued vigor of its competitors. It should not, does not propose to, and will not be allowed to favor its own private mobile customers by way of connections with its 'land lines' not allowed to the customers of its competitors. It will be required to maintain charges which are fully compensatory. It will be under the disadvantage of being unable to enter into price competition with its competitors to secure the business of particularly desirable customers; and it will be required to serve customers its competitors may not elect to serve. There is no danger here which would justify our going to the Legislature to ask to be relieved of the duty which the law now imposes upon us to regulate the service.

"The commission finds that competition of regulated companies with the nonregulated, if it is unfair at all, is more likely to be unfair to the regulated rather than to the nonregulated competitors. The record made it clear, and a supplemental filing has given additional assurance, that the applicant will not grant special favors in connection with its regular telephone service to its own mobile telephone customers. In any event, in the commission's opinion, the public has less to fear from the activities of a 'monopoly' when such 'monopoly' is fully regulated by public authorities and we fail to find that Pacific will be in a position to compete unfairly with its smaller rivals.

"While it was frequently asserted at the hearing that Pacific's motive was to avoid the Consent Decree, there was no proof and the commission certainly will not take judicial notice of good or bad intentions. In any event, it is for the federal courts, and not for this commission, to implement their decisions; and the Consent Decree seems specifically to assume that such activities as the one here in contemplation can be rendered by applicant without any injurious effect on the public welfare, so long as such activities are regulated by state commissions. We believe that, if this is the implication of the Consent Decree, it is a fully justified position. If the fed-

(*Continued on page* 78)

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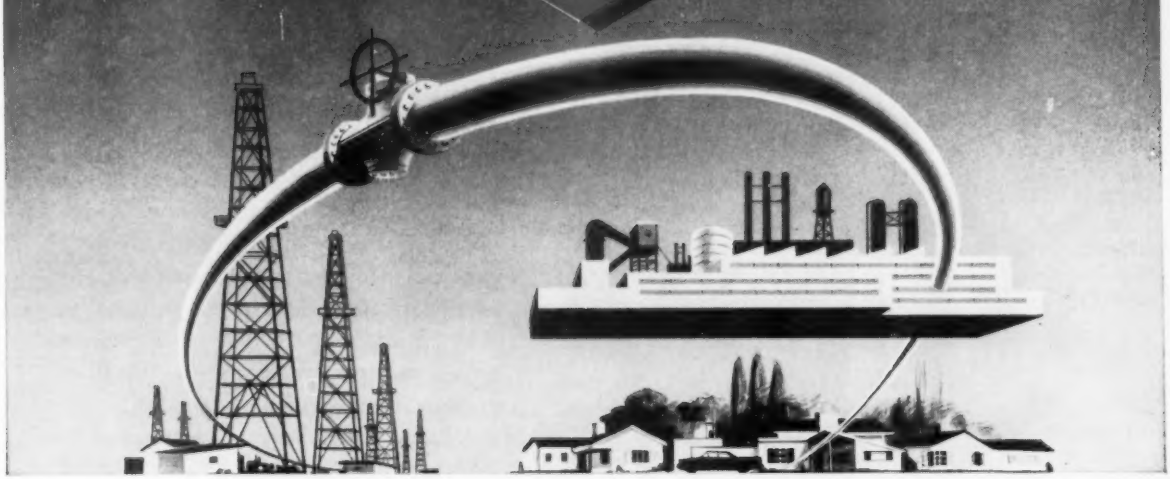

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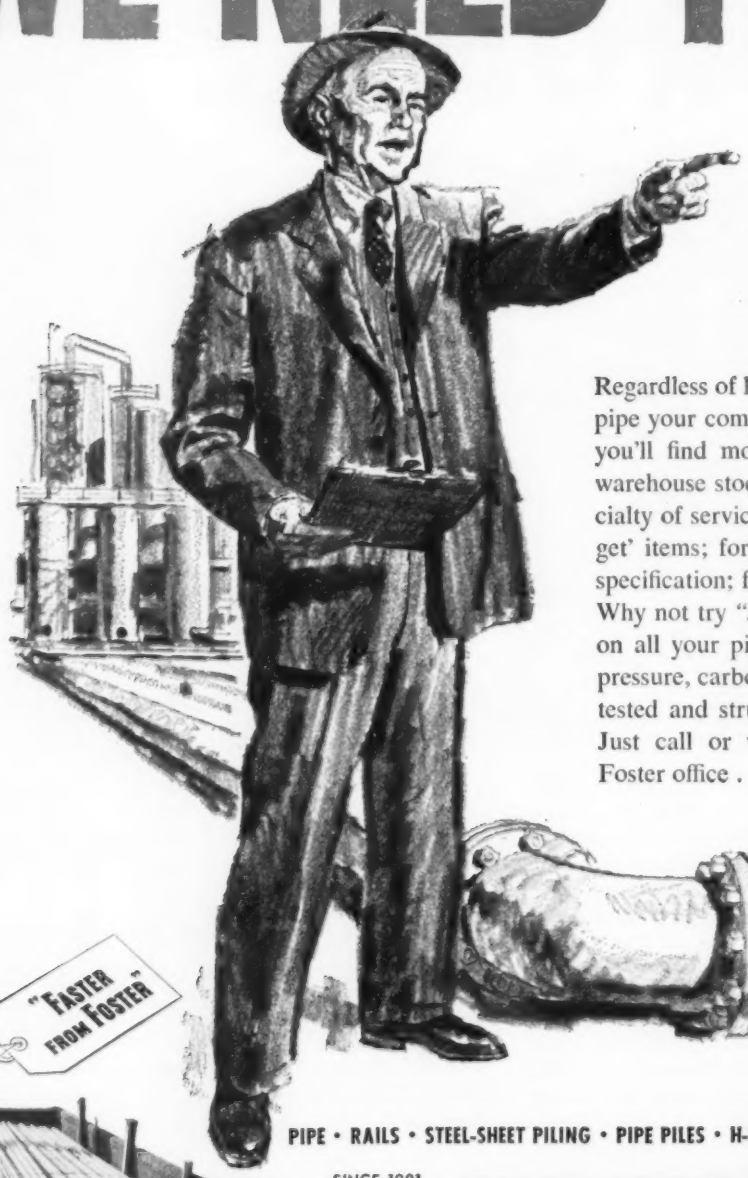

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WASHINGTON

Congressmen checking underground storage

By **NEIL REGEIMBAL**
GAS Washington Bureau

SEVERAL congressmen are watching a move in the Maryland State legislature to impose rigid restrictions on the underground storage of natural gas.

The Maryland bill is aimed at the Washington Gas Light Co. The utility wants to store natural gas between 1300 and 1500 ft underground in the southeastern part of Maryland—right over the District line from the Nation's Capital.

When the company mentioned this plan, the local citizenry banded together to demand protection. They used a New Jersey law as a model. It requires state permission and regulation of all underground gas storage.

Despite reassurances from geologists and company experts, the Marylanders are fearful the gas would contaminate their drinking water wells. Washington Gas has campaigned to persuade the residents that the plan is harmless.

The Maryland bill would:

1. Prohibit drilling or opening of any permeable sand or stratum into which gas is forced so that avoidable escape of gas could occur.

2. Prohibit any well connected with an underground gas reservoir from being situated within 50 yd of a residence or building.

3. Require all fresh water sands penetrated in drilling for a storage reservoir to be fully protected by a cement grout placed in such a manner as to effectively seal in the nearest thick clay bed above the gas storage stratum. The clay bed would have to be at least 25 ft thick.

The gas utility has acquired options on much of the land it needs for the reservoir. Twice, it failed to obtain authority to condemn the underground strata they need from the legislature.

Because of the nearness of this gas storage fight to the halls of Congress, several congressmen who have proposed federal gas safety legislation of various types say they are going to keep an eye on the way the fight develops. They believe that regulation of underground storage may be a ripe field for federal legislation.

* * * * *

THE federal government would keep close watch on gas and petroleum industry from wellhead to home if Congress goes along with a proposal by Rep. John W. Heselton (R.—Mass.)

Representative Heselton has introduced a bill (H.R. 4684) to establish a National Petroleum Commission. This 11-man commission could issue such rules "as it deems necessary for the protection of the national security and economy."

The bill would transfer to the new commission all duties now possessed by any agency of the government covering regulation of the transportation or sale of natural gas and petroleum and petroleum products.

The Federal Power Commission, under this bill, would have to content itself with telling the electric utilities how to run their business. The new commission would run the gas business.

The Heselton bill was referred to the House Interstate and Foreign Commerce Commission, which, according to a spokesman, "isn't much interested in pursuing it now."

Representative Heselton is also sponsoring a bill (H.R. 4395) to reduce percentage depletion allowance for oil and gas wells from 27½ per cent to 15 per cent.

Repeated attempts have been made to knock down the gas and oil depletion allowances, which are among the highest permitted. The Eisenhower Administration feels that the depletions "are about right," and won't back such a move this year.

* * * * *

THE steel supply picture for the rest of the year as far as gas utilities, pipelines, and producers are concerned should be fairly bright.

Steel mills are beginning to catch up with demand for most products. As the pressures ease on one product, the slack is used to meet demands in other lines.

Heavy steel line pipe and heavy plate probably will continue to be in tight, but adequate, supply.

Prices, however, are up. In addition, to the $8.50 a ton increase of last summer, prices generally have been raised by about $5 a ton.

Last year, oil and gas industries, including warehouses, received over 5.5 million net tons of finished steel products. Total production of finished steel in 1956 amounted to 83.2 million tons, down 1.5 million tons from the peak year of 1955. ■

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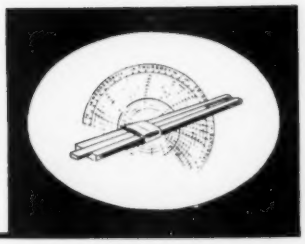
technical trends



By GUY CORFIELD

Technical and industrial revolution

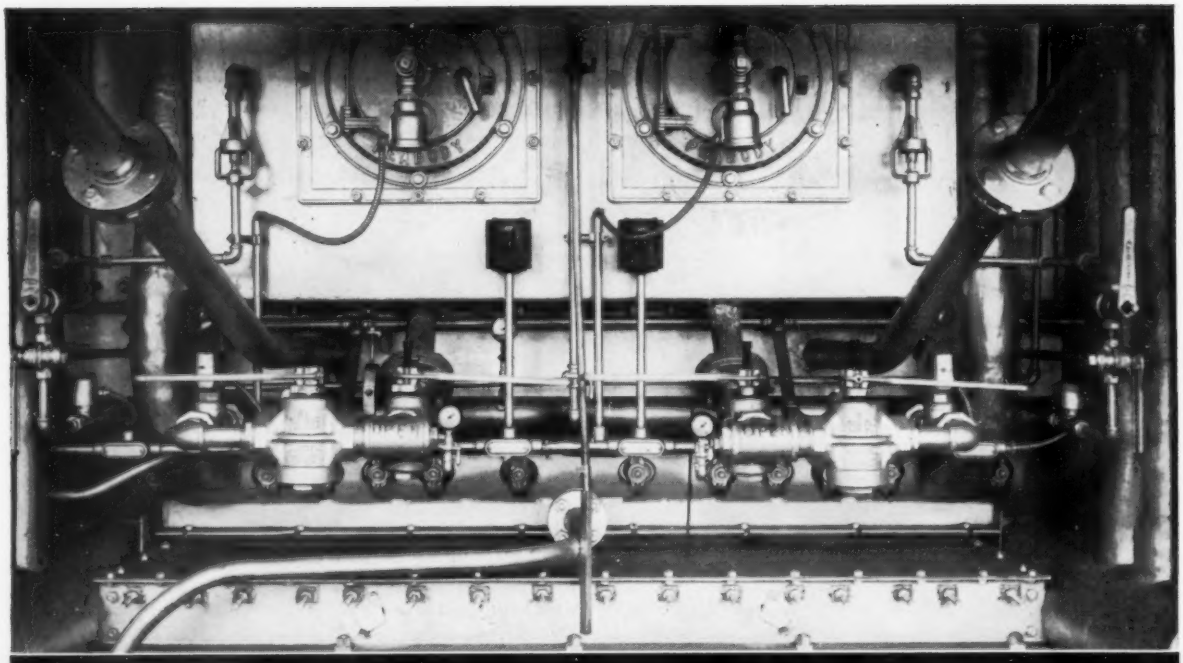
To observers of current developments in industry and education, it is apparent that we are now going through a technical and industrial revolution as profound and significant as any that has been recognized and chronicled in past history. This can be attributed to two major developments: automation, and scarcity of technical personnel. One writer, viewing the more general situation, adds a new "dimension" to U. S. economy, which he terms "velocity," stating that "the pivotal problem . . . is a manpower shortage which is worsening because of the increased velocity in . . . transportation, automation, research, electronics, etc." He states that "while we are accustomed to saying that such developments are shrinking the size of the world, what we are actually doing is shrinking time by adding to the velocity of everything around us."

There are many definitions of automation. In a recent article in *Instruments & Automation* it was defined as the use of mechanical, hydraulic, pneumatic, electrical and electronic devices for making automatic decisions and efforts . . . elimination of repetitive, onerous, dangerous and trivial labor, mental or physical . . . the science and art of production at maximum efficiency and minimum cost. Some people are afraid of automation, particularly computers, perhaps because they do not understand them. They do not realize that computers are slaves and not masters, and while they can do marvelous and seemingly intelligent things that they are told to do, they cannot think to the point of making independent decisions, profiting by experience, making emergency changes in programs in response to unexpected happenings, etc. However all business and industry leaders are recognizing that failure to apply automation will mean falling behind in the ever quickening competitive race. George Meany, president of AFL-CIO, assertedly accepts the advent of automation because it has so far allowed industry to cheapen products, widen markets and create more jobs. If and when it results in cutting out jobs and threatening unemployment, however, he has announced that he will seek shorter hours without pay reduction.

To the educator and the student, this "revolution" also means a change in previous concepts. It is already recognized that we can no longer afford or expect our technical college graduates to do lower skill, routine or repetitive tasks, and it is important to develop future engineers, physicists and chemical graduates so that they can accept and undertake leadership in technical control, change and advancement. The technician in the control laboratory, instrument repair shop or operating plant is also changing his duties and perspective as instruments change from indicating to recording, and from spot test to continuous analysis, as operations become more integrated and automatic and plant processes change from batch to continuous flow. The plant technician is now becoming the custodian and interpreter of complex analytical and recording devices.

All this not only involves a re-evaluation of future educational policies but also the need for a "crash program" to cope with present and immediate future exigencies of technical and scientific manpower shortages. This latter is gathering momentum. Organizations are scanning their personnel to uncover and redistribute talent to better advantage. In keeping with the automatic trend, General Electric Co. uses a central data processing system (computer) to pinpoint specific talent among its 10,000 engineers in some 150 plants. An engineering personnel register system processes information (previously fed into it) covering each employee's training, work background, personal interests and apparent potentials, and in a few minutes selects the applicable group and the best qualified in this group.

There are a variety of other approaches. One is an attempt to interest high school students in taking engineering courses. One company invites teen-age children of employees into its laboratories, to work under general staff direction; participants receive achievement certificates and enjoy the program. Some companies have plant tours, and provide guest classroom lectures and demonstrations. Others provide summer work not only to students but to teachers, in the belief that teacher influence on students' choice of vocation is very great. Others have "in industry" training, sending employees to school one semester and working them the next, registering them in special courses, etc.



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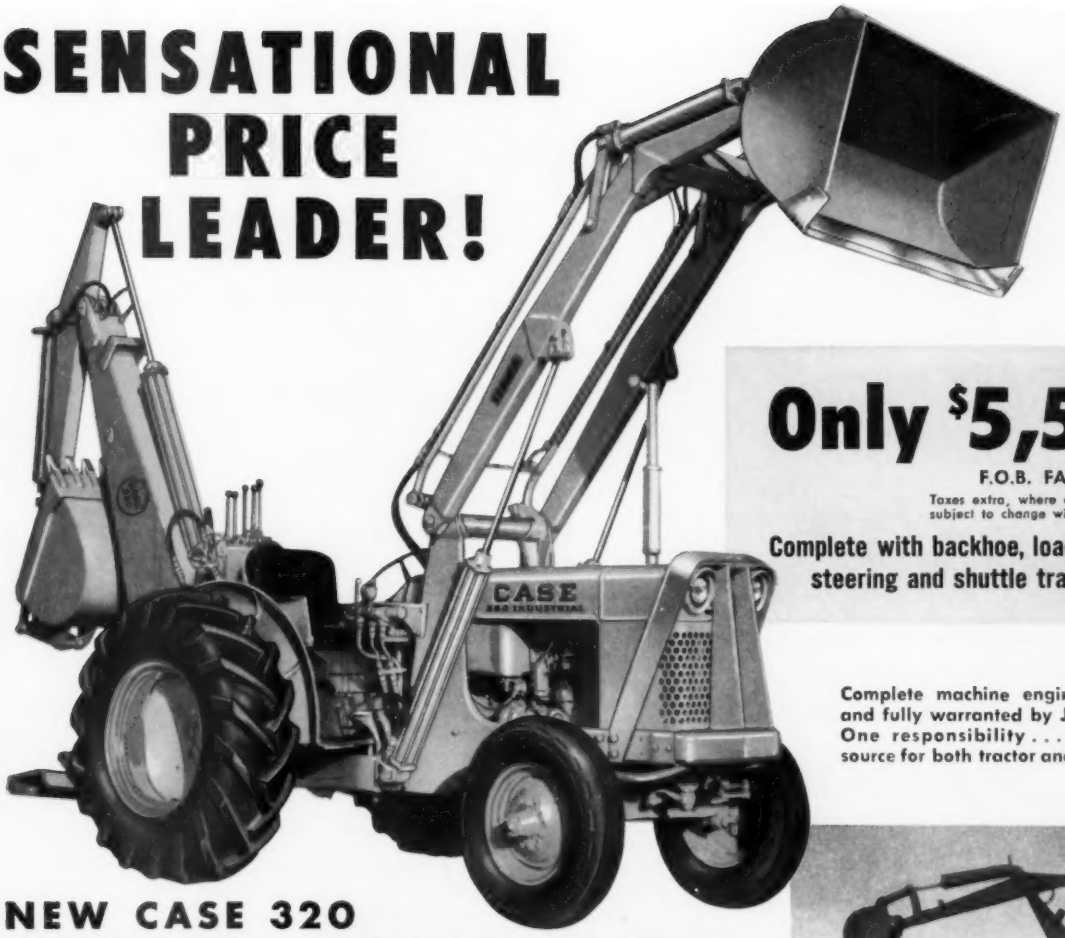

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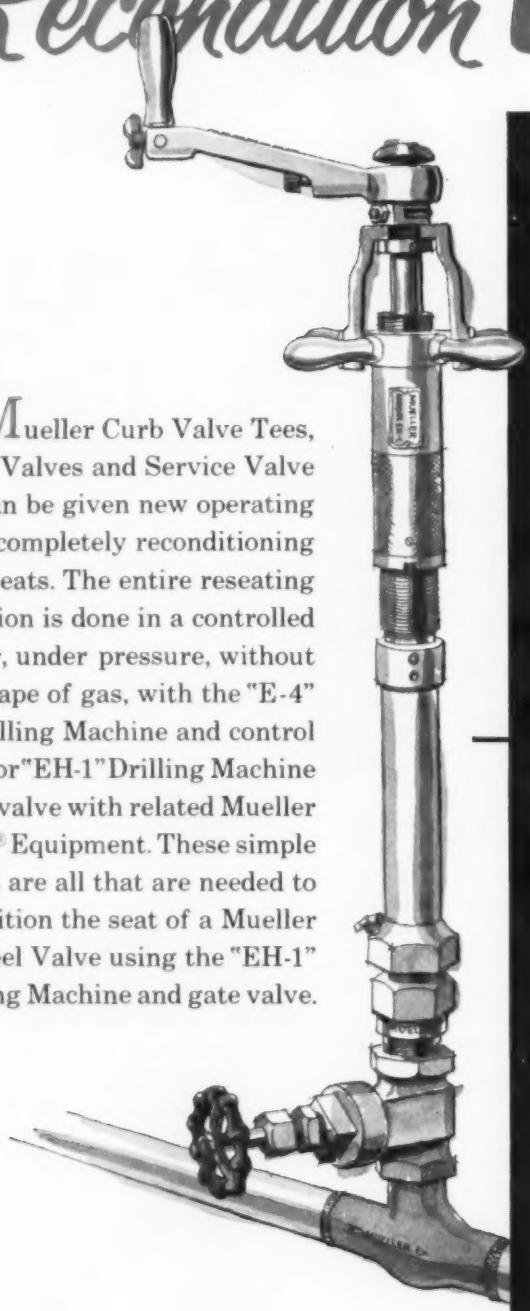
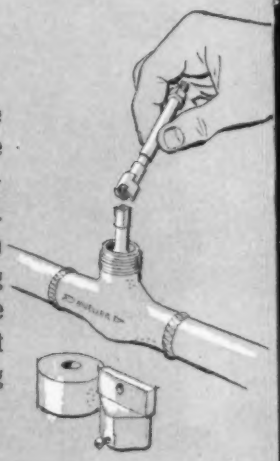


Mueller Curb Valve Tees, Capped Steel Valves and Service Valve Tees, can be given new operating life by completely reconditioning valve seats. The entire reseating operation is done in a controlled manner, under pressure, without escape of gas, with the "E-4" Drilling Machine and control chamber or "EH-1" Drilling Machine and gate valve with related Mueller NO-BLO® Equipment. These simple steps are all that are needed to recondition the seat of a Mueller Steel Valve using the "EH-1" Drilling Machine and gate valve.

STEP 1

Prepare fitting. Close the valve tightly. Remove tee handle and cap. Attach extracting tool to valve stem. Open gate valve and attach to valve body. Mount drilling machine with adapter nipple to gate valve. Be sure that bleeder valve on the drilling machine is closed.



STEP 4

Install stem. Attach valve stem and inserting tool to boring bar. Mount machine, open gate valve and advance boring bar until stem threads contact top thread in valve body. Rotate ratchet handle clockwise until stem is seated solidly against seat.

MUELLER NO-BLO® Method

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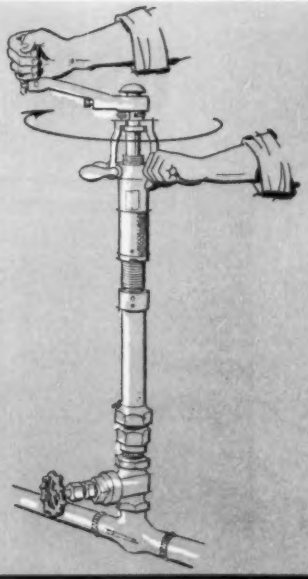
under pressure!

STEP 2

Remove stem. Lower boring bar to contact extracting tool. Rotate ratchet handle counter-clockwise to engage threads. Continue counter-clockwise rotation to remove stem from the valve. Retract boring bar, close gate valve, open bleeder valve, remove machine.

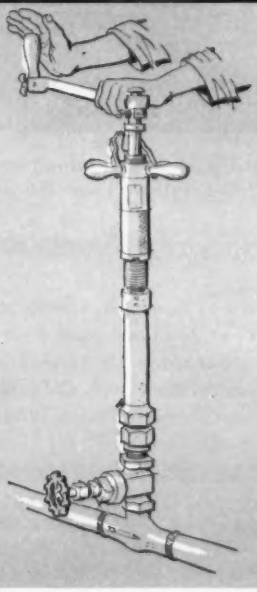
STEP 3

Ream seat. Attach reseating reamer to boring bar. Remount, open valve and lower reamer against seat. Adjust the feed yoke, applying light pressure while rotating handle clockwise. Remove yoke, retract boring bar, close gate valve, open bleeder valve and remove machine.



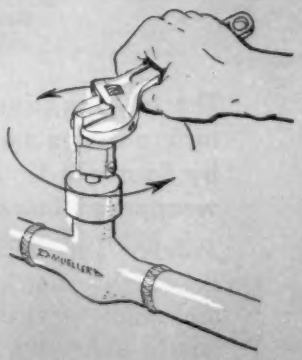
STEP 5

Remove machine. Strike ratchet handle sharply in a counter-clockwise direction with hand to free inserting tool. Unscrew inserting tool from stem. Retract boring bar. Open bleeder valve to check for tightness. Remove machine and gate valve.



STEP 6

Cap valve. Lubricate "O" rings in steel cap and screw tightly onto valve body. Install tee handle on valve stem. Reseating operation is now complete and valve may be placed back in operation in "like new" condition.



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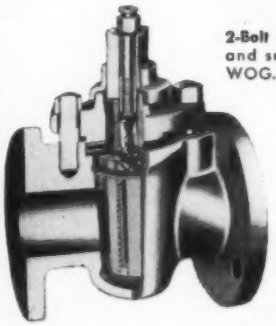
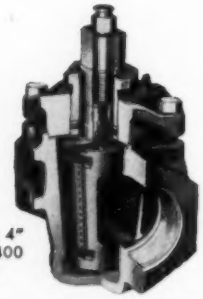
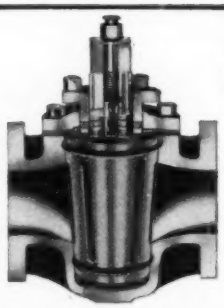


2-Bolt Cover Type Valve in 4" and smaller sizes for 175-lb WOG. *Semi-Steel*



Screwed Gland Type Valve in 4" and smaller sizes for 200, 400 and 500-lb WOG. *Semi-Steel*



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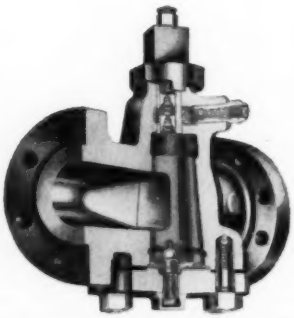
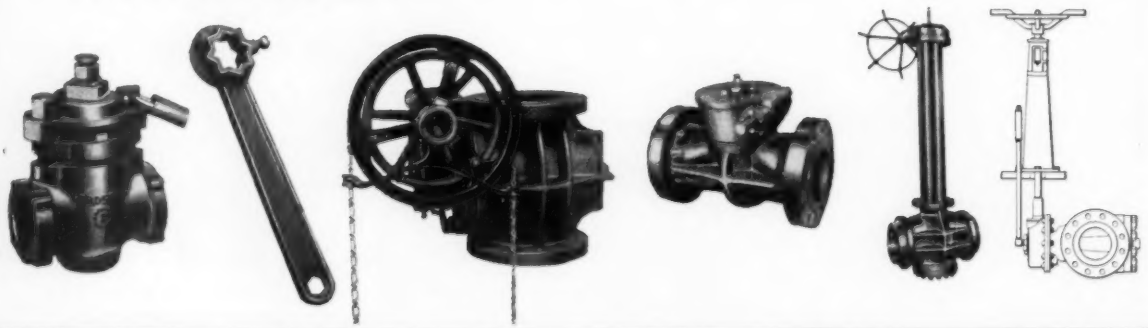


LUBRICANTS

PROPER VALVE LUBRICATION means longer valve life and better performance at lower cost. Rockwell is the world's oldest and most experienced manufacturer of lubricated plug valve lubricants. To assure perfect performance, a *complete line* of lubricants has been developed and field proved. For convenience, they are available in stick, tube and bulk forms. The Rockwell High Pressure Booster Type Hand Gun and Rockwell High Pressure Booster Type Bucket Gun make the lubrication of even a great number of valves a job that takes only minutes.

ACCESSORIES

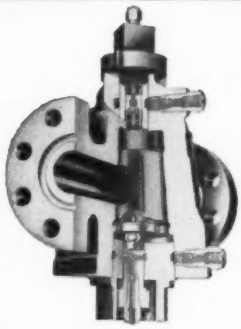


GREATER DESIGN AND INSTALLATION FREEDOM are the "extras" you get when you specify Rockwell-Nordstrom valves and accessories. No matter what your operating requirements or problems, you can select from a *complete* line of valve accessories that assure easier, safer, more efficient operation.

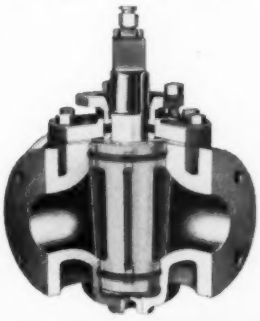
While only a few of the valve accessories are shown above, you can learn about the complete selection by talking with your Rockwell-Nordstrom sales engineer or writing directly to: Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pennsylvania.

LINE OF LUBRICATED PLUG VALVES,

ACCESSORIES



Hypreseal Valve—Screwed Bottom Cover Type. ½" to 8" for 7500-lb WOG Alloy Steel (rectangular opening). ASA 2500-lb Carbon Steel (rectangular opening). API 5000-lb and 10,000-lb WOG (rectangular opening) and API 5000-lb and 10,000-lb WOG (round opening).



Multiport Valve Type. Available in Gland type and Hypreseal type in WOG pressures to 400 lb and ASA pressures to 1500-lb. Sizes from ½" to 24".

ALL THESE ADVANTAGES

In *Every* Rockwell-Nordstrom Valve.

LEAKPROOF: Lubricant sealing is a *double* seal against leakage.

LONG-LIFE: Lubricant prevents metal-to-metal wearing friction.

LOW-COST: Lubrication is preventive maintenance.

DEPENDABLE: Hydraulic lubricant action jacks plug for instant operation.

QUARTER-TURN OPERATION: 90° turn for *full* positive shut-off.

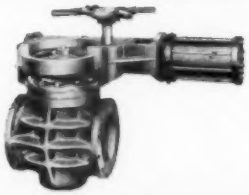
SMOOTH PASSAGE: Straight-through flow without crevices . . . minimum pressure drop.

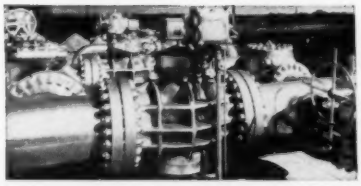
UNEXPOSED SEATS: Corrosion and erosion eliminated in vital seat areas.

ADJUST, LUBRICATE UNDER PRESSURE: Never down time for routine servicing.

No other valve—at any price—can offer the performance and longer life at lower cost of Rockwell-Nordstrom valves.

POWER OPERATORS

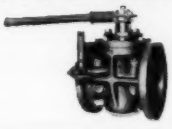


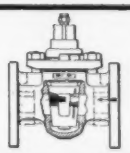


AUTOMATIC VALVE OPERATION is more dependable and economical when you specify Rockwell-Nordstrom valves. They are far superior to ordinary valves for power operation because *lubrication* reduces operating torque—smaller, less costly actuators can be used. And since there are no forced, wedged seats to be set, the actuator has only to move the lubricated plug through 90°.

Typical electric, pneumatic and cylinder operators shown above represent only three of the more than fourteen power operation arrangements available.

VALVES WITH SPECIAL FEATURES





NO MATTER WHAT YOUR NEEDS, there is a Rockwell-Nordstrom valve that will do the job better, longer and at lower cost. A few of the Rockwell-Nordstrom valves with special features are shown above.

Special metal valves are available in stainless-steel, bronze and other corrosion resisting alloys for even the toughest services. Valves with *hard faced plugs and bodies* combine the economy of semi-steel with hard facing for utmost corrosion and wear resistance. *Steam jacketed valves* for precise product temperature control. *By-pass relief valves* prevent pressure build-up that imposes dangerous stress on ordinary valves and fittings. *Gas safety control (Factory Mutual) valves* for positive control against explosion in multi-burner gas-fired furnaces, ovens and driers.

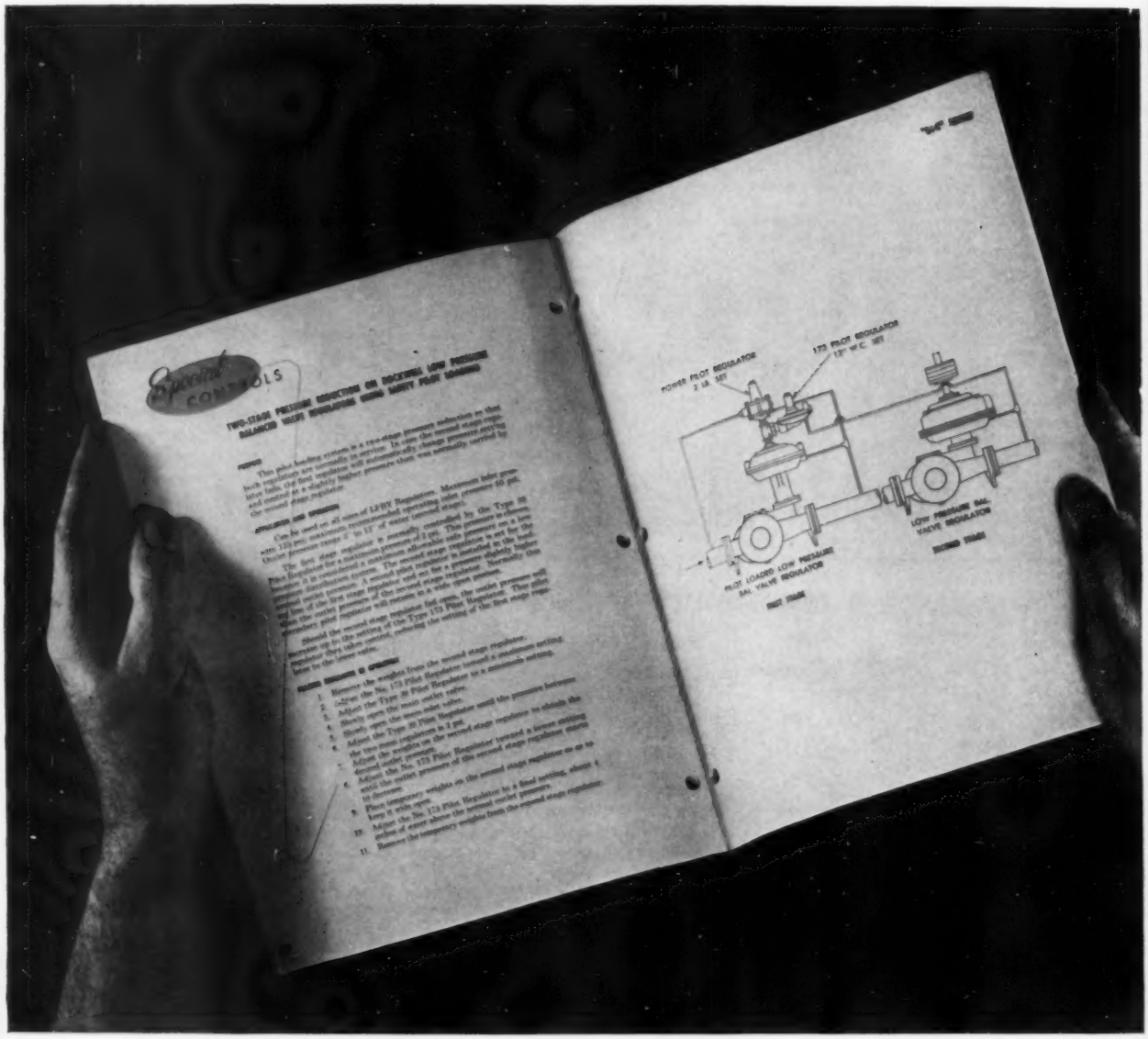
* * * *

Rockwell-Nordstrom valves and accessories are available at leading oil field and industrial distributors everywhere. For full information write: Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pa. Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-off

NEW...


Special CONTROLS
TWO-STAGE PRESSURE REDUCTION OR BOOSTING LOW PRESSURE BALANCED VALVE REGULATORS USING SAFETY PILOT SHUTOFF
PURPOSE
APPLICATION AND OPERATION
PILOT REGULATOR IS OPERATING
1. Remove the weights from the second stage regulator.
2. Adjust the No. 173 Pilot Regulator to a minimum setting.
3. Adjust the Type 30 Pilot Regulator to a minimum setting.
4. Slowly open the main outlet valve.
5. Adjust the Type 30 Pilot Regulator until the pressures between the two zones regulators is 2 psi.
6. Adjust the weights on the second stage regulator to obtain the desired outlet pressure.
7. Adjust the No. 173 Pilot Regulator toward a lower setting until the outlet pressure of the second stage regulator starts to decrease.
8. Place temporary weights on the second stage regulator so as to keep it wide open.
9. Adjust the No. 173 Pilot Regulator to a final setting, about 4 inches of water above the second outlet pressure.
10. Remove the temporary weights from the second stage regulator.
11.
POWER PILOT REGULATOR 2 LB. SET
173 PILOT REGULATOR 12" W.C. SET
PILOT LOADED LOW PRESSURE BAL. VALVE REGULATOR
FIRST STAGE
LOW PRESSURE BAL. VALVE REGULATOR
SECOND STAGE

There's a size and type

LOW PRESSURE "014" Either inside or outside weights

LOW PRESSURE "014" Pilot Loaded

HIGH PRESSURE "015" Spring Loaded

HIGH PRESSURE "015" Lever and Weight Control

and especially written for you!

Special Control Manual for Rockwell Balanced Valve Regulators

This new pressure control manual should be in every gas distribution engineer's hands. It shows by easy-to-follow diagrams and explanatory text how *versatile* Rockwell "014" and "015" regulators can be adapted to meet a great variety of performance requirements.

There are 16 special arrangements illustrated and discussed in 36 information-packed pages. These simple hook-ups include monitor control, safety shut-offs, pilot controls, auxiliary systems and low pressure cut-offs, to name a few. You can use such information with profit to your company and credit to yourself. This helpful manual is yours for the asking. Write for your copy of bulletin 1094 today.

Also available—this pocket size Regulator Handbook. Ask for bulletin 1090.

Rockwell Manufacturing Company

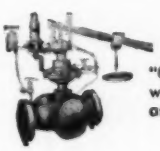
PITTSBURGH 8, PA.

Atlanta Boston Charlotte Chicago Dallas Denver Houston Kansas City, Mo. Los Angeles Midland, Texas New York Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa

In Canada: Rockwell Manufacturing Company of Canada, Ltd., Toronto, Ontario

Rockwell Regulator for every need

HIGH PRESSURE "015" Pilot Loaded



HIGH PRESSURE "015" Pilot Loaded with auxiliary lever and weight control

HIGH PRESSURE "015" Pilot Loaded with auxiliary spring control

HIGH PRESSURE "015" Instrument Control

Need specialized help in any of these directions?

The modern approach to solving special operating problems is to call in specialized help. That way you don't divert your own key personnel from regular duties. You don't overburden your regular staff. And you save a maximum of payroll dollars. Backed by long experience in solving similar problems for gas companies throughout the United States and abroad, Ebasco gets to work promptly, gets the job done right and economically while your normal flow of routine operations continues.

Ebasco technicians are at your call anywhere and anytime you need them, for assignments large or small in any phase of manufactured or natural gas operations.

ENGINEERS · CONSTRUCTORS
EBASCO
BUSINESS CONSULTANTS

NEW YORK · CHICAGO · DALLAS
PORTLAND, ORE. · WASHINGTON, D.C.

COMPLETE ENGINEERING AND CONSTRUCTION SERVICES

In addition to assisting with operating problems, Ebasco offers a complete engineering and construction service for building new facilities or additions to present installations—from initial planning to actual operation of the plant or pipeline. A half century of experience in the gas industry stands behind this service.

For a complete outline of the services Ebasco offers, write for our booklet, "The Inside Story of Outside Help." Address: Ebasco Services Incorporated, Dept. F, Two Rector St., New York 6, N.Y.

Underground corrosion

robs $600,000,000 a year!*

But Naugatuck KRALASTIC can't corrode!

It can't rust or rot—is free from electrolytic action—impervious to water and the usual soil elements—highly resistant to most chemicals. Pipe made of Kralastic® rubber-resin never needs coating, lining or anode protection.

What's more, amazingly tough Kralastic pipe gives a host of *other* advantages over conventional pipe materials.

- Kralastic pipe is extremely lightweight—needs no heavy handling equipment or costly bedding.
- It can be snaked through many existing lines—eliminates much time and money-wasting ditching.
- It offers extremely low internal friction—will not accumulate scale.
- It can be quickly and easily solvent welded—by relatively unskilled workers. Or it may be threaded and used with threaded fittings.
- Kralastic has outstanding impact strength—even at Arctic temperatures.

In short, Kralastic is a *non-corroding* pipe material with a combination of properties *no other pipe material can match.*

Molders and extruders are finding KRALASTIC ideal for such products as combs; wheels; window channels; cases for small appliances such as hearing aids and electric shavers; housings for office and other types of machines, as well as for pipe.

Better look into Kralastic today. Simply write on your letterhead to the address below.

*Estimate of the U.S. Government National Bureau of Standards.

US RUBBER

United States Rubber

Naugatuck Chemical Division

Naugatuck, Connecticut

BRANCHES: Akron • Boston • Gastonia, N.C. • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latices • Cable Address: Rubexport, N. Y.

TYPE 99-1
2" screwed connections, hi-tensile iron, steel or bronze body.

FISHER®

The Fisher Series 99 is adaptable to hundreds of applications now requiring an assortment of several types of regulators. It is the ideal regulator to have in stock.

From Inches Water Column to 20 psi Outlet Setting —with only a simple adjustment or spring change.

From Inches Water Column to 65 psi Outlet Setting —with only a quick pilot replacement.

FEATURES

- Factory pre-set spring provides powerful lock-off action.
- Large, effective area of main diaphragm in combination with relay pilot assures trouble-free accuracy.
- 2" threaded or flanged inlet and outlet. Hi-tensile iron, steel and bronze bodies for inlet pressures up to 250 PSI.
- Composition valve disc or O-Ring inner valve construction assures tight shut-off on zero flow and excellent regulation from no flow to maximum capacity.

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NOW AVAILABLE

For complete details, write for Fisher Bulletin P-99C today.

FISHER GOVERNOR

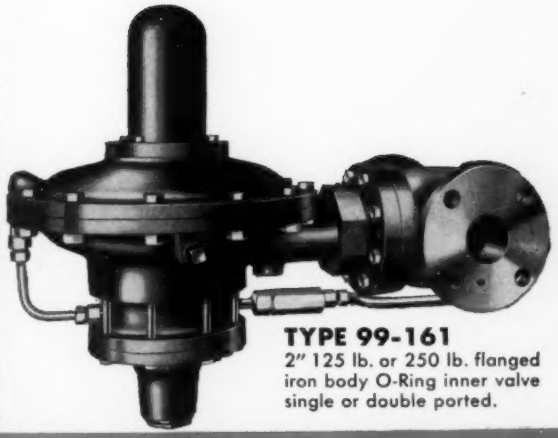
LEADS THE INDUSTRY IN RESEARCH FOR

SERIES 99

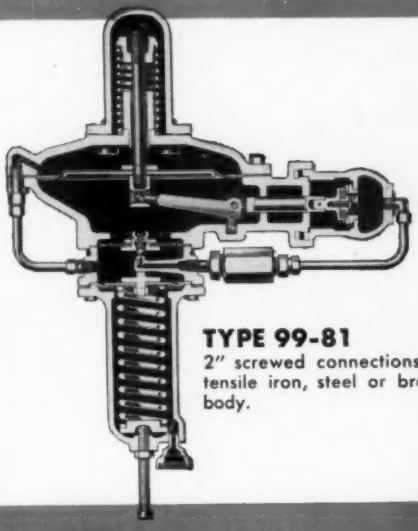
MULTI-PURPOSE PRESSURE REDUCING

Gas Regulators

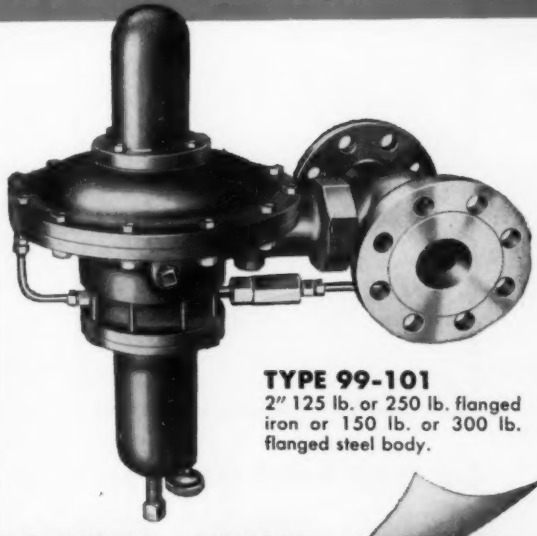
SCREWED or FLANGED CONNECTIONS



TYPE 99-161
2" 125 lb. or 250 lb. flanged iron body O-Ring inner valve single or double ported.



TYPE 99-81
2" screwed connections, hi-tensile iron, steel or bronze body.



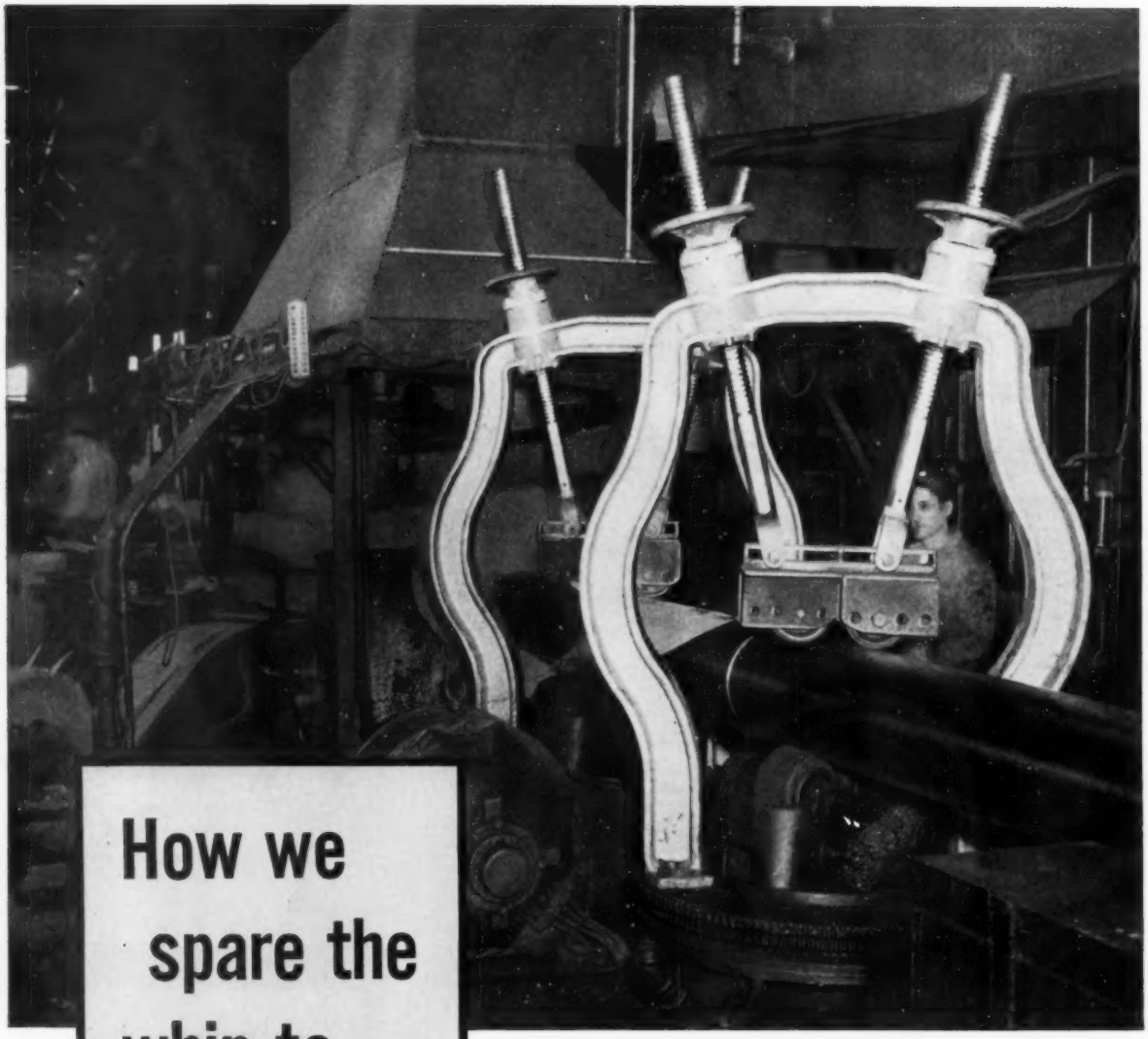
TYPE 99-101
2" 125 lb. or 250 lb. flanged iron or 150 lb. or 300 lb. flanged steel body.

COMPANY · MARSHALLTOWN, IOWA
CANADIAN PLANT: WOODSTOCK, ONTARIO

BETTER GAS PRESSURE CONTROL

FISHER

Since 1880



How we spare the whip to protect your pipe

You know how the bearings prevent crankshaft whip in your car. Hill-Hubbell took the same principle, adapted it to the pipe wrapping business. Thus the giant double yoke shown above, grips and steadies pipe as it is fed spirally into the coating-wrapping machine. This prevents whip, eliminates any irregularity in the thickness of the coatings or the tension of the wrappings. The "whip preventer" is another Hill-Hubbell first, another reason to—

Specify Hill-Hubbell wrapped pipe on your next job

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

HILL·HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3091 MAYFIELD ROAD, CLEVELAND 18, OHIO

DRESSER LEADS
in application of plastics to problems of leakage and corrosion

Field and laboratory testing reveals improved application techniques

There is logically a lot of interest in the application of epoxy resins and other plastics to the problems of preventing or stopping leaks in gas mains and in corrosion prevention. These plastics offer good promise of facilitating repair and preventive maintenance with a consequent important saving in time and money.

For more than a year, Dresser's experience in the field with Epi-Seal has resulted in considerable practical knowledge of the use of plastics under field conditions. As it has been in the past with other new products, Dresser has naturally co-operated very closely with gas companies in adapting the new plastic compounds to their problems.

It is our broad aim to develop solutions to gas company problems, not just new products. Therefore, considerable investigation was conducted on plastic sealing methods before actual development was started a year ago. Field demonstrations and regular applications have shown that Epi-Seal has been effective when applied to:

- Bell-and-Spigot Joints (both internally and externally).
- Leaking plugs in mains.
- Solid sleeves and fittings.
- Leaking tanks and holders.
- Corroded sections of pipe (armoring).

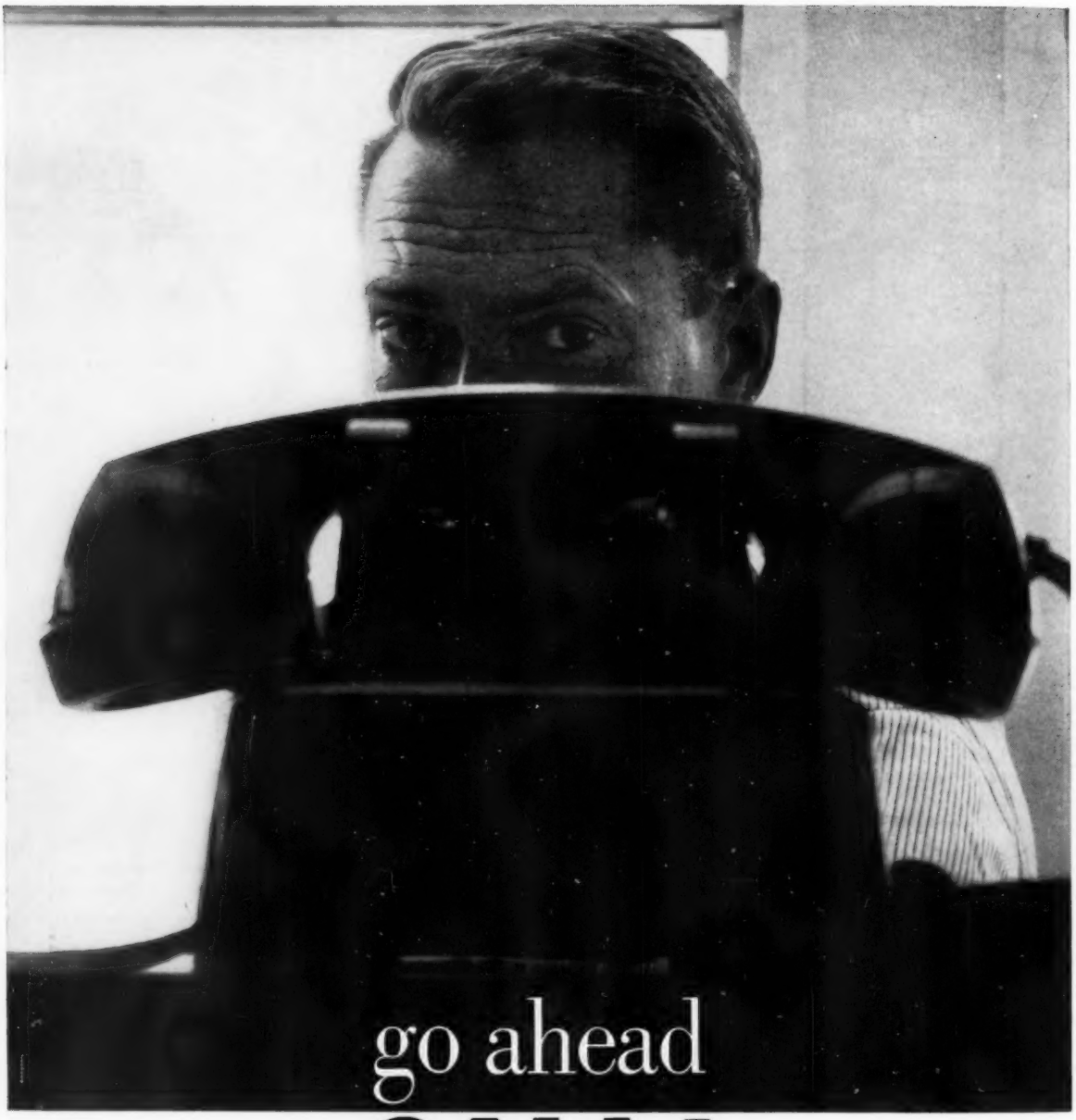
Dresser has also done extensive investigation into the application of the excellent dielectric strength of plastics to the problems of corrosion abatement.

We're pleased to announce that Dresser has set up a separate development department to assist the gas companies with their testing and use of plastics. We can offer technical help both as to materials and methods. Your inquiries are invited. Write today to Plastic Products and Development Section, Dresser Manufacturing Division, Bradford, Pennsylvania.

A special Epi-Seal Public Utility Kit containing all materials needed for a complete repair on any size or kind of pipe is now available. Ask your Dresser Field Engineer about it.

DRESSER® ONE OF THE DRESSER INDUSTRIES **FITTING PARTNER FOR THE GAS INDUSTRY**

Dresser Manufacturing Division, 59 Fisher Ave., Bradford, Pa. Warehouses: 1121 Rothwell St., Houston; 101 S. Airport Blvd., S. San Francisco. Sales Offices also in: New York, Philadelphia, Chicago, Atlanta, Denver. In Canada: Toronto, Calgary.



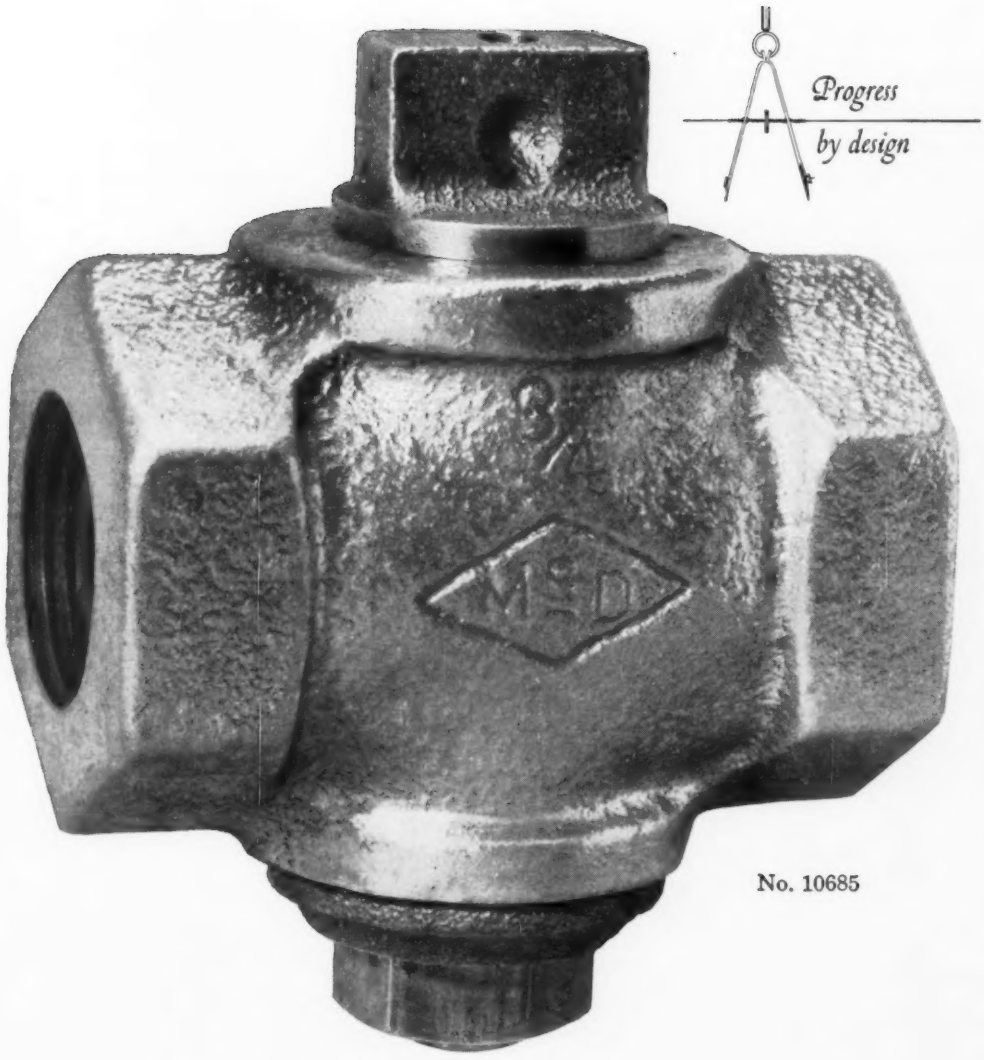
CALL!

the fastest cure for worry about cancer: a call to your doctor now!

Scared? You shouldn't be! Look at it this way. The average man who walks into the doctor's office walks out floating. That lump that was so frightening . . . nothing to worry about at all! The sky's bluer, the air's sweeter, it's a great big beautiful day . . . because he picked up that phone and called!

It happens all the time. It can happen to *you*. "Sure," you say, "but just supposing"... OK. Let's look at the facts. In past years, we were saving 1 out of 4 cancer patients. Today, we're saving 1 in 3. And the odds could get better still . . . if *people would call their doctors in time!*

So go ahead... call. See your doctor now. And after your checkup—how about a check for the American Cancer Society? Every dollar sends us further along the road to cure. And when *that* happens . . . it's going to be a wonderful day for us all! Send your check to "Cancer" in care of your local Post Office.



No. 10685

McDonald Gas Service Stops... machined to exact specifications: made of the finest metals, accepted as standard by municipalities the country over. Carefully assembled and tested to assure perfect performance. These stops have iron bodies, flat ways, and are the heavy pattern type. They are available in black or galvanized. A catalog of our complete line of gas service stops will be sent on request.

A. Y. McDONALD Mfg. Co., Dubuque, Iowa • Pumps • Brass goods • Oil equipment • Drains

OVER 100 YEARS

Our Experience Is Your Assurance of Efficient and Economical General Plant Additions

At United Engineers you'll find the flexibility of organization and wealth of experience you require for handling any major additions to your plant facilities. No matter what the project—the installation of gas handling and treating equipment, reinforcements to plant electric and mechanical services, additions to your buildings or gas distribution system—we are able to provide complete design and construction services or to supplement your organization to any extent required.

Remember, well-planned engineering and construction are as important to your general plant additions as they are to your installations of gas production equipment. They mean real economies in maintenance and operation which accrue through the years.

Outdoor installation of 2500 Mcf per hour at 20 psig electric motor driven compressor recently placed in service at the West End Gas Works, Jersey City, N.J., for Public Service Electric and Gas Company, Newark, New Jersey.

UNITED ENGINEERS

& Constructors Inc

U.E.&C. (Canada) Ltd.

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100,000 feet of trench in eight months on scattered jobs—that's what a Barber-Greene ditcher delivered for a Midwest utility company.

12 Barber-Greene ditchers travel 800 miles . . . dig 100 jobs daily

To speed up house service installation, a Midwest utility, name upon request, bought three Barber-Greene Model 711 Ditchers. These ditchers paid off so well that nine more similar units with variations in boom design were soon added to meet the growing need for fast service trenching in the 250 different communities served by this progressive utility. This fleet of 12 has dug over 625,000 feet of trench in less than a year. As a result of this performance record, four more of these versatile ditchers have been added to the line—boosting the total to 16.

Here are some of the features of the Barber-Greene Model 711 . . .

Unmatched mobility: Rubber-tired mounting provides fast job-to-job travel. Easy to drive, this Barber-Greene cruises at 45 m.p.h. . . . shrinks distances between jobs.

One-man operation: Once on the job, the operator merely lowers the boom and starts digging. Hydra-Crowd control permits infinite range of digging speeds from 0-13 feet per min.

Greater traction: . . . with four-wheel drive. An important feature when digging on slopes and hillsides or on soft, muddy ground that often surrounds new housing projects.

Saves lawns and curbing: Low bearing pressure and proper weight distribution offer real protection to lawns, sidewalks and curbing. Low height prevents entanglement with trees.

This is just one of five different Barber-Greene ditchers, each designed to cut costs on a wide variety of jobs.

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

"Natural" Selection for Cedar Falls

AMERICAN
CAST IRON PIPE

When a natural gas supply became available for the first time, the Cedar Falls, Iowa, municipal utility changed and enlarged its distribution system. The change-over from manufactured gas allowed increased service for both old and new customers.

Although the gas was changed, the pipe was not. In the old system, ninety-five percent of the lines were cast iron pipe. Much of this pipe had been in service for forty years.

American Double-X Mechanical Joint Pipe was the natural selection for Cedar Falls' new lines. Bottle-tight, corrosion-resistant American Double-X is time-proved for wet or dry gas service. Its "cast iron" durability and economy has been established by a record of service unequalled by pipe made of any other material.

Specify American Cast Iron Pipe for your new gas distribution system — or an addition to your existing system. Long, trouble-free operation will compliment the wisdom of your decision.

45,600 feet of American Double-X Mechanical Joint Pipe, in four to twelve inch diameters, was furnished to the Cedar Falls, Iowa, gas utility. This main connects to the high pressure natural gas transmission lines.

SALES OFFICES

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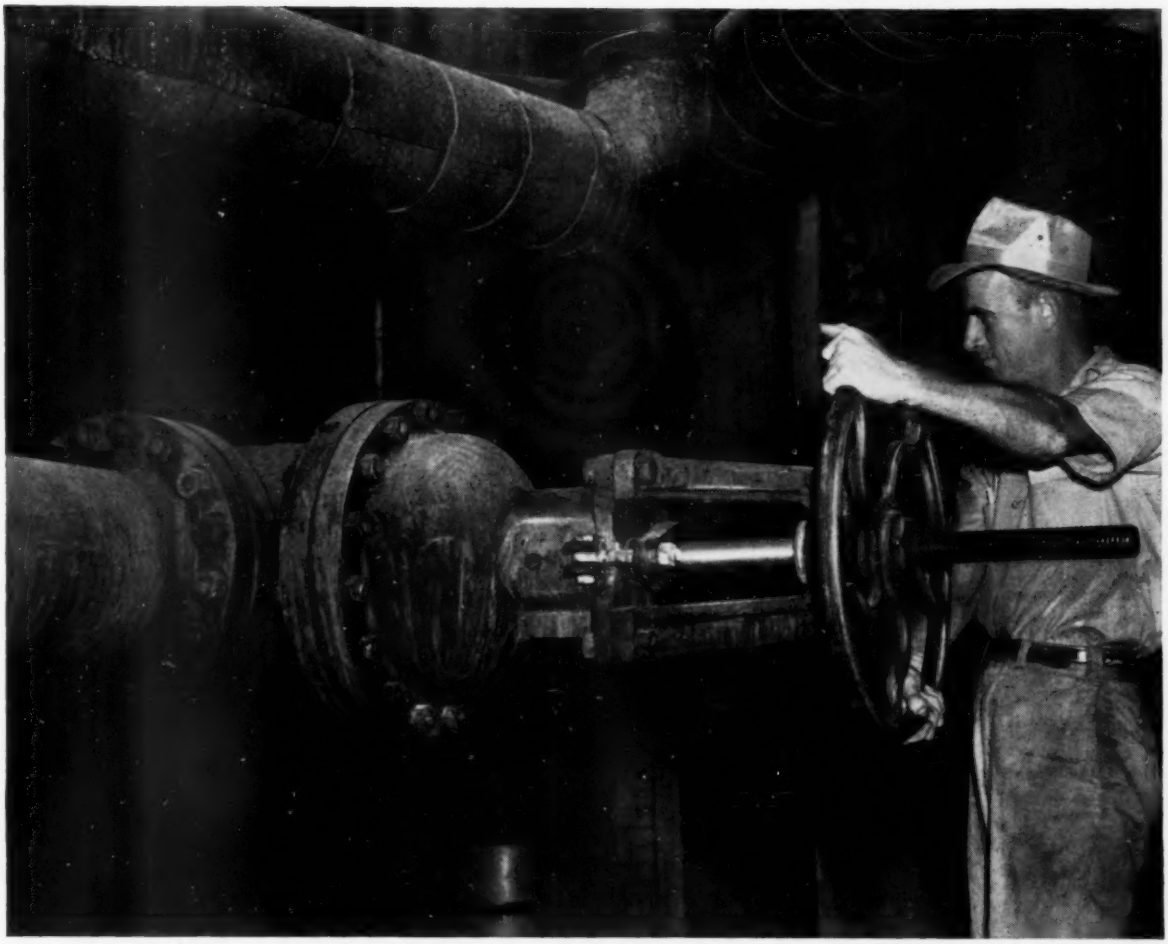
San Francisco • Cleveland

AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

These Crane Valves Excel on Secondary Digester Blowdown



Crane 10-inch, 300-lb. No. 33XL cast steel gate valve with 18-8 liners installed on digester in major paper mill, handling corrosive liquors at 100 psi., 400°F.

"Too tough for hot, corrosive liquors"

. . . That's the report this major paper mill gives on Crane No. 33XL cast steel gate valves.

Up to 6 years ago, the mill was forced to replace secondary digester blowdown valves on every shutdown. Corrosion worked the body seat rings loose, made valve closure impossible.

Why did these Crane 33XL valves eliminate this costly maintenance problem? Because the body seat rings, liners and flange faces of these valves are 18-8 SMo alloy, integrally welded—making them tough enough to withstand the hot, corrosive liquors.

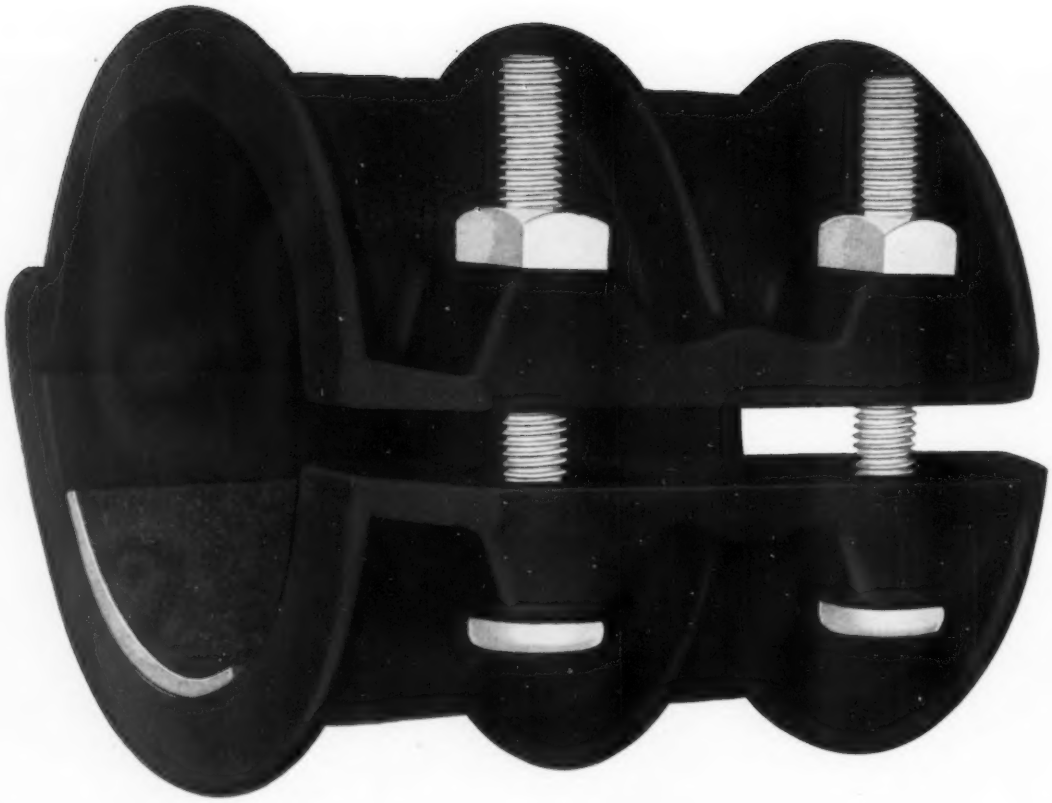
When you buy valves on price alone—or because they "look good enough"—you're gambling with your production. Be sure: choose your valves and fittings from the big, complete, strictly quality Crane line—first choice of industry for a century.

You may spot cost-saving ideas in this book of "Valve Performance Facts"—32 case histories throughout industry. Ask your Crane Representative, or write for a copy.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas



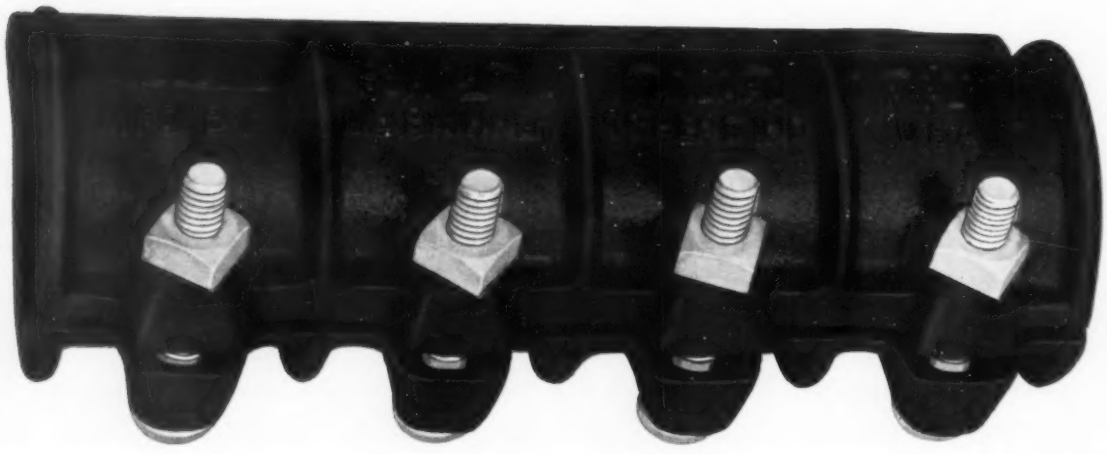
EMERGENCY PIPE CLAMP

SKINNER-SEAL

PIPE LINE CLAMP

For repairing corrosion leaks and splits in pipe lines! Its action is definite and final under any pressure or temperature. Sizes ½" to 12" inclusive, for steel and also cast iron pipe. Stocked by most supply stores.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U.S.A.



GAS

DISTRIBUTION ISSUE

APRIL 1957

PROBLEMS—Every gas distribution company has them. Currently, what are the most important operating problems? Editors of GAS took to the field to answer this question.

To our surprise, the many operating gasmen contacted felt nearly all of their problems were important. It was not possible to find a standard for degree of importance. However, we learned that several operating problems kept turning up. These seemed common problems, not limited to companies of certain sizes or geographical locations. Some of the common operating problems were—

ODORIZATION. This general problem is the source of many sub-problems. Prevention of fade out at remote points; calibration of and setting odorizers; neutralization of spilled malodorant, etc., all vex the operating gasman.

PEAK SHAVING. Peak days give most companies trouble. Shortage of gas for extreme loads ties-in with demand rates. Most gasmen wanted a report on the latest in peak shaving plant technique, utilizing refrigerated LPG storage.

PLANT EXPERIENCE. Among the manufactured gas companies, the most heard problems were those connected with gas plant function. Many of the "gas house gang" wanted practical experience with plant production of high-Btu oil-gas. Such plants find use for basic send-out gas production and increased use for peak shaving.

PIPE ACCOUNTING. Receiving, stocking and shipping pipe—particularly in the smaller diameters—is not only a materials handling problem. Accounting matters cause a problem. The linear foot is generally used for accounting; however, when a million or so feet of "spaghetti" flows through a gas company's operations in a single year, bills of lading, tallies, and records are apt to become a problem.

Examples of how these problems are being solved are in this special issue. We made no attempt to find final answers. But, we did turn up ways specific companies are handling these problems. Naturally, it is not expected that a single company's method will give a solution to a problem that can be used on a national scale. Probably, your company can apply part or all of one or more of these problem answers to its work.

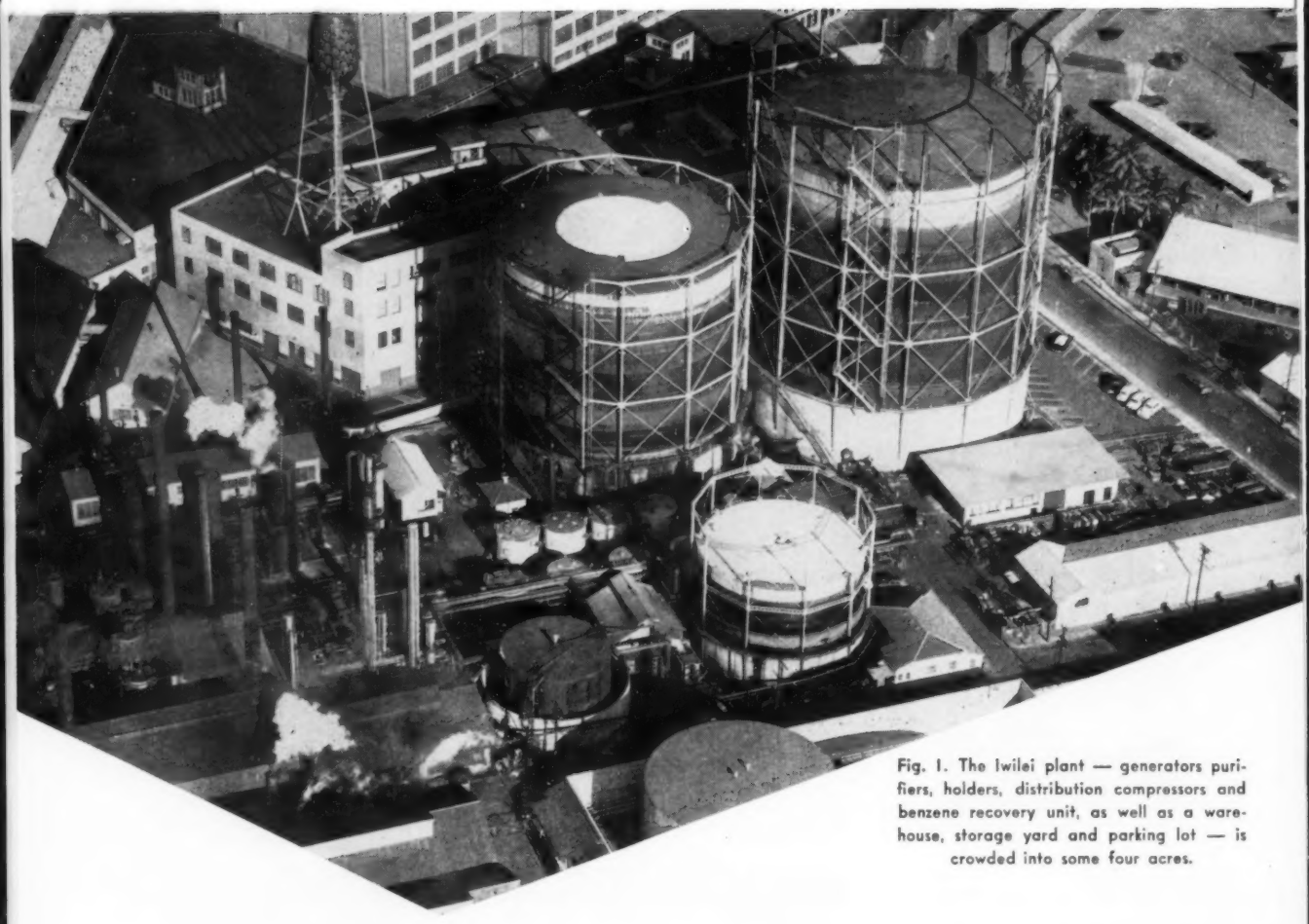


Fig. 1. The Iwilei plant — generators purifiers, holders, distribution compressors and benzene recovery unit, as well as a warehouse, storage yard and parking lot — is crowded into some four acres.

Honolulu Gas' experiences with high Btu oil gas

By **GEORGE B. TUGGLE,**
Vice President and
PAUL C. JOY,
Plant Superintendent
Honolulu Gas Co. Ltd.

GAS exclusive

Hawaii is unique in many ways. It is the principal military outpost of the United States in the Pacific. It is the home of the Hula girl. Its people are a scramble of races and religions and enthusiastic Americans all. It is an outspoken candidate for statehood, even though it lies far outside the continental limits of North America. Its supply of beautiful weather is almost beyond belief. And it is about the only American city which has never looked forward to the arrival of natural gas.

Honolulu's gas has been manufactured from oil from the beginning and will continue to be so made as far as any forseeable future. *(Fig. 1)*. The generation of high Btu oil gas has therefore been to us not a matter of standby or supplemental supply but rather of primary operation. We have, as a result, developed it with a great deal of earnestness. Some of the methods we have developed are not used elsewhere to the best of our knowledge.

For instance, there is our feed-

stock, which is asphalt. It arrives from California as part of a special blend made up roughly of 68 per cent asphalt, 25 per cent diesel oil and 7 per cent butane. This blend is split after its arrival in Honolulu into its three original components. The butane is taken by Honolulu Gas Co. for LPG distribution throughout the Islands; the diesel oil is taken by the Standard Oil Co. of California; the asphalt is taken by Standard Oil Co. for general distribution as well as for sale to Gasco for gas-making.

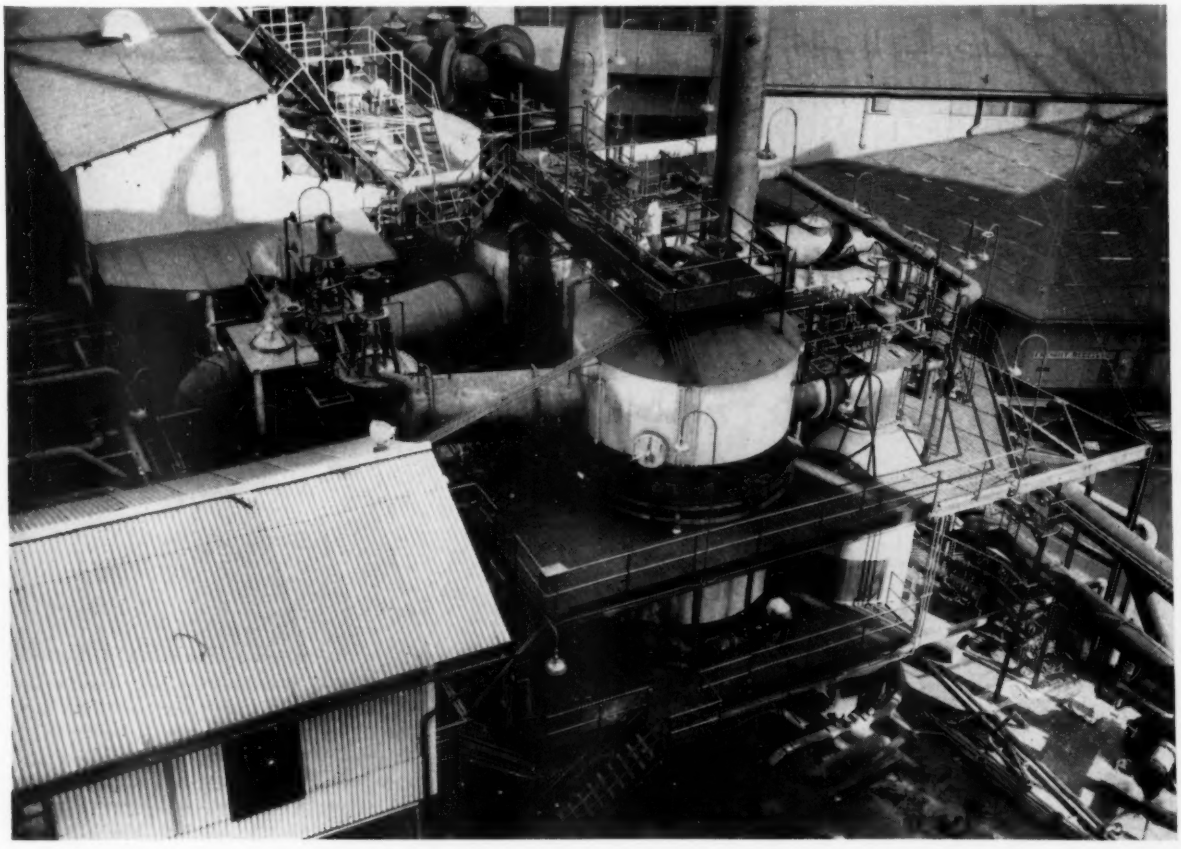
The asphalt as it comes to Gasco varies between 200 and 400 penetration at our option. It is, for our present operation, as economical a feedstock as we have ever used, and we have settled on it after trying a variety of gas oils, bunker oils and topped crudes.

From 1904 to 1951 the Honolulu Gas Co. produced by the Pacific Coast oil gas process low Btu gas —nominally 515 Btu/cu ft, 0.55 sp gr. Until 1946, the principal control instrument was the washbox sealpot. As long as there was a skim of dull gray lampblack on the surface of the water, operation was excellent. When there appeared a shiny film of tar, the gas maker knew he was in for washbox trouble if he did not "get hot" literally and quickly.

At the beginning of World War II there were two 4 MMcf and two old 2 MMcf/day generators operative. On Dec. 7, 1941, as a small diversion from their devastating work at Pearl Harbor three miles away, a group of Japanese planes flew over the gas plant and the pilot of one of them tossed a chunk of scrap steel through the crown of a 1 MMcf holder. A 30-ft jet of flame burst out above the pumpkin-sized hole and continued to flare as the holder sank lower and lower. At the time the only loss was the gas consumed, but the six-year period ushered in by this event was a frantic and baffling one. With sendout climbing, equipment became impossible to get and the only available oils progressively contained more and more sulfur. By 1946, plant operation was a nightmare of breakdowns. Purification was inadequate. Lampblack was everywhere and smoke rolled in long black plumes from boilers and generators alike. Test pans set out in our next door neighbor's premises indicated that we were dropping some 600 lb of lampblack per day on his property.

The period from 1946 to 1951 was one primarily of rehabilitation. A new boiler was installed in 1946; two iron oxide purifiers, doubling capacity, in 1947; a third 4 MMcf/day per day generator in 1948. A policy of transferring routine responsibilities from the plant superintendent to the principal supervisors under him was instituted. Every effort was made to transform the operating personnel into understanding, watchful, cooperative crews. Weekly supervisory conferences were instituted.

Fig. 2. View on No. 8 generator shells, ductwork (center) and control house (lower left). The operator (upper center) is replacing the make oil mechanical atomizers which are installed in the top center of each of the two large shells, one atomizer to each shell.



Operating and overhaul schedules were begun, with guiding check-off lists for both. Essential alarm systems were installed and tested regularly. Standby machinery was given frequent, regular, operating tests. A most valuable aid was a system of work requests by means of which *any* plant man could point out unsafe or unsatisfactory conditions. At the beginning of 1949, A. E. Englebright, Ebasco Services' chief gas engineer, was employed by the Honolulu Gas Co. as its vice president and general manager. He at once began making plans to market aromatic light oils and tars. An integral part of the plans lay in changing our process from low Btu to high Btu oil gas generation for the purposes of (1) increasing light oil and tar production, and (2) eliminating the production of washbox lampblack.

In January 1951, a benzol recovery plant was put into operation and we began the change in gas generation as well. We moved from low Btu to high Btu gas generation, one generator at a time. The washbox liquor system was split into a lampblack section and a tar section during the conversion period. With high Btu generators our principal control instrument became a Ranarex specific gravity recorder sampling from the individual generator washbox offtakes. No one process value was completely trusted, however. Actually we felt out the new process by temperatures, pressures, tar quality, smoke, sounds, smells, calorific values, phases of the moon and the gasmaker's pulse - rate. Next to the primary interim object of producing a high Btu gas that our customers could burn satisfactorily with burners adjusted for manufactured gas, our most pressing consideration was keeping the washboxes from plugging. Tar in the washbox had constituted an emergency situation so long that all plant men were frankly nervous over the unknown but almost certain grief to be encountered in the period of feeling out the new process. Several times, in spite of all precautions, we did plug a washbox and had to clean it under severe pressure to get the generator back into operation. It was only gradually and by dint of trials and errors and anxious moments that we developed the understanding and improved controls necessary to the proper handling of the heavy tars.

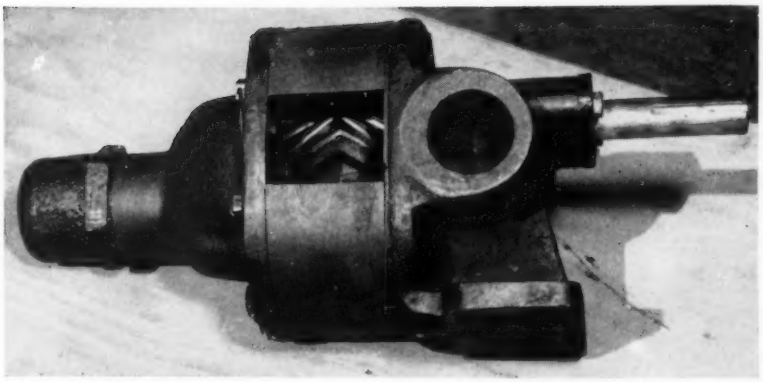
In the early part of 1951 we operated one high and one low Btu generator; then on Sept. 1, 1951, we went entirely to high Btu gas. From our original 515-Btu/cu ft we had increased the calorific value of the street gas (after light oil removal) to 565 during the hi-lo generator operation, and then to 625 on Sept. 1, 1951. Since then, after trying a series of feedstocks and process details aimed at optimum economy, we have brought the street gas to 750 Btu/cu ft and calculate we will in time climb to about 850. (*Fig. 2*).

To maintain our gas at a sufficiently constant burning quality to avoid customer troubles, we added air to hold the street gas at a Flame Factor $\frac{\text{BTU/cu ft}}{\text{Sp Gr}}$ of

Fig. 3. Controller governs the mixing of air into the gas stream to maintain a blended gas of quite constant combustion characteristics. The greater luminous burning characteristic of the incoming gas, the more air is added to offset its increased tendency toward yellowness of flame and vice versa. The correction maintains a sufficiently constant "flame factor" to be well within the limits of good burner operation.

Fig. 4. Controller has two special bunsen-type burners—one control, the other alarm. The settings on both are alike. The alarm caloroptic simply checks the control caloroptic. If for any reason, such as an error in the control caloroptic or an error in itself, the alarm caloroptic reads the flame as too yellow or not yellow enough, it sets off audible and visual alarms that notify the operator that the controller must be checked.

Fig. 5. Gear pump modified for use in tar transfer. It is suspended in the tar layer of the settling pits. The casing is purposely cut away to permit lumps of approximately I in. in diameter to have free access to the gear teeth. No strainer is used. A new pump has to be installed about once in every five months.



700, which was that of our begining gas at 515 Btu and 0.55 sp gr. At first we used a Roots-Connersville lobe-type blower coupled through a hydraulic control system to our station meter so as to maintain a fixed speed relationship between the two and thereby a fixed volumetric relationship between gas and air. Later on, we obtained a Connelly Caloroptic controller and set it in direct control of the blower speed *(Figs. 3 & 4)*. Since then air injection has been automatically controlled so as to maintain a constant flame luminosity. Customer complaints arising from straying specific gravities and calorific values have been negligible.

The addition of air, however, has not been an unmitigated blessing. When at last in early 1956, we arrived at a feedstock and cracking level that promised to be permanent we found ourselves adding air to as much as 35 per cent of the total city gas volume. We then began to worry about holder and line capacities given over to air, the potential corrosion problem in our mains, and the horsepower-hours used up in useless compression of the air. We are now embarked on a long time air-elimination program involving step-wise readjustments of customers' appliances. We have moved in a year's time from 660 to 750 Btu and from a 700 to an 800 flame factor. The street gas still contains slightly more than 20 per cent air, by volume.

The quantities of heavy gummy tar produced in the high Btu process posed an early and lasting problem. Once we had gotten it out of the washboxes, there yet remained a multitude of problems: How to pump it? How to de-water it? Where to put it? How to burn it? During the first days, when making gas was of primary importance, we mixed our light scrubber tars with the heavy washbox tars and stored the mixture in the storage holder tanks somewhat in the spirit of sweeping cigarette ashes under the rug. Later on, when the generators were under control, we finally came to grips with the tar problem. At that time we:

(1.) Had several million gallons of emulsified, lumpy, unsaleable tar in the holders.

(2.) Had to continue putting our entire tar stream into the holders until we found a way to disperse the lampblack chunks in and de-emulsify the heavy washbox tar and burn it in the boilers.

Our first attempts at demulsification treatment of the washbox tar were discouraging. Weeks passed and one failure followed another. The level of emulsified tar in the holders rose higher and higher. In our more dejected moments we would contemplate our neighbors' reaction to a stream of tar running down the street from our plant to the harbor. Fortunately, that situation never came to pass, for all of a sudden the young engineer we had on the job came up with a workable solution: (1) the right wetting agent (in this case Nopcogen 22-0); (2) grinding in a Morehouse paint mill to a maximum particle size of 0.01-in.; (3) 12 hours settling time. Under this treatment, water content of the tar dropped as low as 10 per cent by weight and the fine lampblack particles formed a suspension which was stable except at points of sharp directional

Fig. 6. Gasco tar-atomizer for boiler use. At left is an externally atomizing atomizer, with the tar opening in the center surrounded by steam jet openings. The Gasco designed cap-and-cone—two views of which are shown—screws on to the cone atomizer. The steam-jar mix jets from the ports in the caps directly against the surface of the cone which deflects it off into a wide hollow pattern. Prior to use of the cone, the holes in the cap of the cone were drilled at angles designed to produce a conventional wide spray pattern but the abrasive particles in the tar eroded the holes in such short order that maintenance became unacceptably costly. The cone face still becomes eroded but at a greatly reduced rate and can be easily salvaged by building it up again with a hard alloy eutectic welding rod.

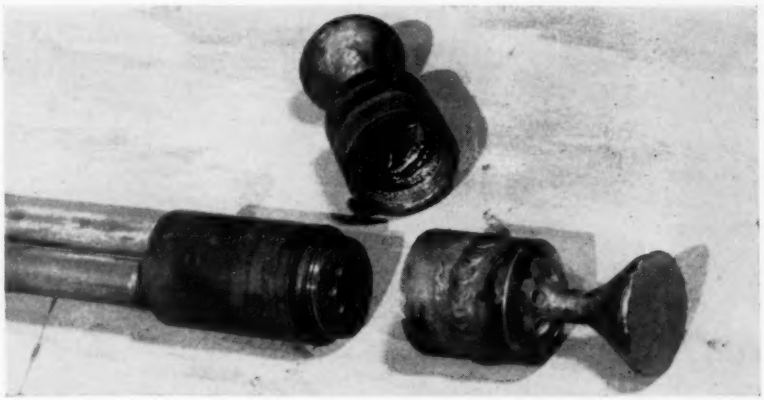


Fig. 7. The mechanical make-oil atomizer in position for lowering into the top center of the make-chamber. With a 60-lb pressure drop it handles 140 gal. per minute of 200 penetration asphalt at 300°F.

changes such as regulating valve seats and orifices.

Today, in actual practice we add the wetting agent via a metering pump to hold the surface tension of the washbox liquor between 60 and 65 dynes per square centimeter. The liquor recirculates, picking up tar in the washboxes and dropping it by gravity separation in settling pits. An inexpensive gear pump *(Fig. 5)* is suspended near the bottom of each settling pit and pumps the tar through a Morehouse paint mill into a second settling pit from which it is pumped to the boilers by a reciprocating steam pump. In order to utilize the gear pump as a crusher as well as a pump, its outer case is cut away on the suction side so that lumps can be drawn directly against the gear teeth. Occasionally the pump jams. In that case, controlled by overload and time-delay relays, it automatically reverses, spews out the hard object, and then re-reverses to go ahead with its chores. A counter placed in the system in its early days showed an average of 20 reversal cycles per day over a six-month period. The pump, amazingly, lasts some five months in this service and is then replaced by a new one costing about $150.

After passing through the paint mill and finally settling, the tar fraction contains some 35 to 40 per cent by weight of finely dispersed lampblack. These solid fines habitually packed tight in pressure regulators and burner tips at the boilers. We finally threw out conventional regulators and flow controllers and installed in their place a gadget developed by our master mechanic consisting of a ring of different sized holes arranged around a steel disc so

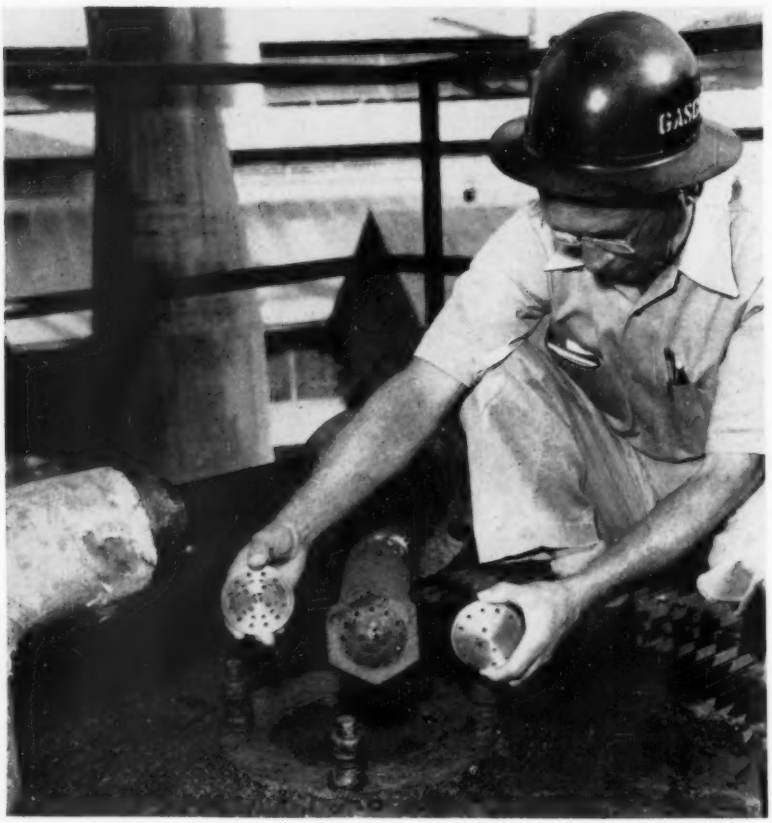


Fig. 8. Honolulu Gas workman frames the business end of a mechanical atomizer with two atomizing plates, one a front view (reader's right) and the other a back view. Plates are made of stainless steel. Use of this two-stream impingement-type atomizer has given radical savings in brickwork and steam.

that, one at a time, they can be rotated into the tar stream as desired. The resulting control, while not a fireman's delight, was entirely adequate. Over the position of the operating orifice a plunger is suspended so that by depressing it a fireman can clear a jam quickly and effectively. This gadget, in honor of the master mechanic, is new called a "murray."

A Cohn externally atomizing burner, in which the fuel flows through a wide-open center port and is atomized by steam jets converging from the outside, has been adapted by our machinist to provide a wide spray pattern and short flame travel. The adaptation involves a special cap-with-cone extension screwed on the end of the burner. The parallel ports of the cap direct the abrasives tar-and-steam jets against the especially hardened conical face of the target *(Fig. 6)*. The overall result is a short, compact flame pattern which gives us virtually smokeless boiler operation and long life of firebox walls.

Oil gas generators are pretty puzzling at times. What comes out —gases, tars, light oils—depends in good part upon what goes on inside the generator. And the fact that the inside of a generator is a pretty inaccessible place during operation leads to many a spirited discussion—with each member of the technical staff juggling uncertain facts and disputed figures to a questionable conclusion which he naturally tends to defend to his last dying breath. Our method of operation in such cases, however, is to use the learned discussions only as a means of setting up actual trials from which we may draw definite conclusions. We use the term "Genius Department" in an affectionate and mildly ironic sense to cover all those who enter into these discussions. So far, although not entirely without strain, the genius department has been able to suggest answers to all the past problems which simply had to be solved.

We have found out a number of things about oil-gas generators in this way— particularly when producing high Btu gas from road asphalt. From a true oil-gas calorific value of *800* in the low Btu days, we jumped first to 1050 in 1951 and then gradually crept up until now we have a true oil-gas Btu content of about 1250. Low Btu gas was comparatively simple to produce, provided we could dispose of the lampblack. The condition of the checker brick was not too critical an item as long as the mass was hot and porous. A set of checkers would be used for as long as six years and then literally chopped out handful by handful.

High Btu oil gas generation is different. Generator refractories must be kept clean and free of slag piles, carbon drifts, ceramic rubble and even oil-ash if it can be prevented. Into any such spongy masses the injected feedstock will find its way as a vapor or liquid. The interior of such masses is invariably cooler than the checker brick and petroleum vapors caught therein crack slowly and incompletely, building up the mass with further coke and tar deposits. Cracking becomes very non-uniform and produces non-aromatic fractions which lower benzol and tar quality. Gasification and thermal efficiency drop and generator stacks become smoky.

Conversely, a clean generator produces highly aromatic tars and light oils; it is easy to control temperature-wise; it operates with little smoke. In short, it is the oil-gas man's friend.

It has taken six years of work to convince ourselves that we can publicly make the statements of the foregoing two paragraphs. One reason for such deliberate progress is that generators are taken off the line only infrequently —once a year in our case—and that is when changes must be made. Another is that oil-gas generators have a tremendous operational inertia and can make an actual period of change so closely resemble one of stabilized operation that we are very cautious lest we jump to an erroneous conclusion.

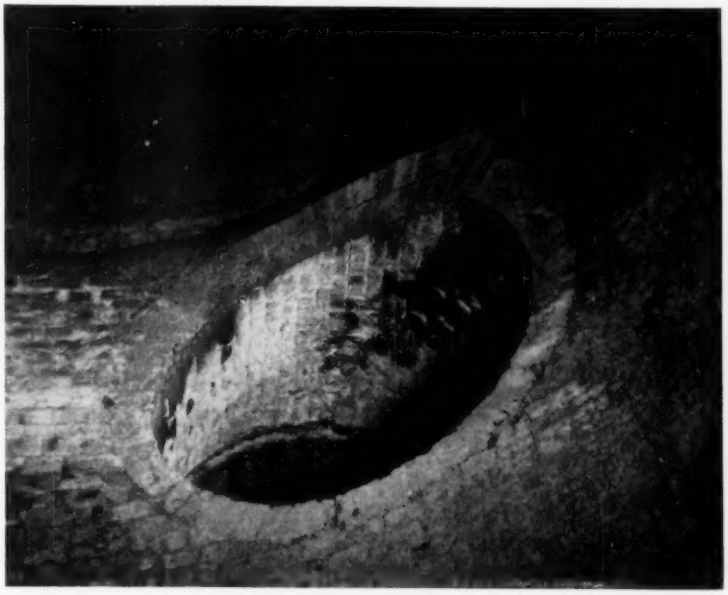


Fig. 9 The 36-in. outlet from the main south shell to the south regenerator of No. 8 generator after one year of service. Prior to the use of mechanical make-oil atomizers these nozzles spalled so radically that they were renewed annually almost as a matter of routine.

As, for instance, we almost convinced ourselves that bunker oil would be a fine feedstock some four years ago. The test began in October, our month of lowest send-out, and all went well. Gasification, smoke and by-product were satisfactory. The only operational feature that seemed discordant was a continuing need for large amounts of cooling steam. Unruly high temperatures usually mean carbon deposits, but we could find no concrete evidence of carbon build-up. As the new year approached we were still puzzled

but not apprehensive of serious trouble. Apparently the generators just naturally ran hotter with bunker feedstock.

The new year brought cooler weather. The daily temperature range dropped from 70° - 80°F to 60° - 70°F, which is the usual difference between summer and winter temperatures in Honolulu. Such a change falls in the category of *minor* catastrophes even in Honolulu, but people did use more gas and we had to put a few more gallons of bunker oil into the generators. Carbon immediately began building up. There were drifts in the throats; great beetling shelves on the upper generator walls; mounds of it on the checker brick. We raked carbon by hand; we blew air through it to burn it out, but nothing helped. Those generators lumbered serenely on, choking up with carbon and rolling greasy black smoke in endless clouds. We had to start up a third generator in order to supply enough gas for Honolulu and order a topped crude to replace the bunker oil. The new feedstock brought us out of our carbon troubles, but 60 frightful days had gone by in the meantime.

Such experiences make us perform experiments in generator operation in much the same way as an experienced man skins a skunk, and that is gingerly. They have not stopped experimentation, however, for the need for reduced air pollution and greater production capacity has pressed us relentlessly. Several of our radical changes have been markedly successful in improving generator efficiency and smoke.

For instance, there was checker brick. In the old low-Btu days we installed 37 courses of stiff-mud straights with 3-in. continuous flues in each generator shell. That was what the drawing called for. With high-Btu operation we began reducing the number of checker brick year by year until when we tried 12 courses we suddenly lost gas-making capacity. As of today we have settled on a total of 16 courses—14 of super-duty and two of high-burned super-duty brick —with 3-in. straight flues, and have a greater gas-making capacity than ever.

Then there was the problem of atomization of the feedstock. Early experience with high Btu operation indicated a rapid deterioration of checker and sidewall brick, almost entirely by spalling. We understood that at temperatures of 1200° - 1400°F, where we expected to operate, the brick were in a more critical area of thermal expansion, and we suspected that

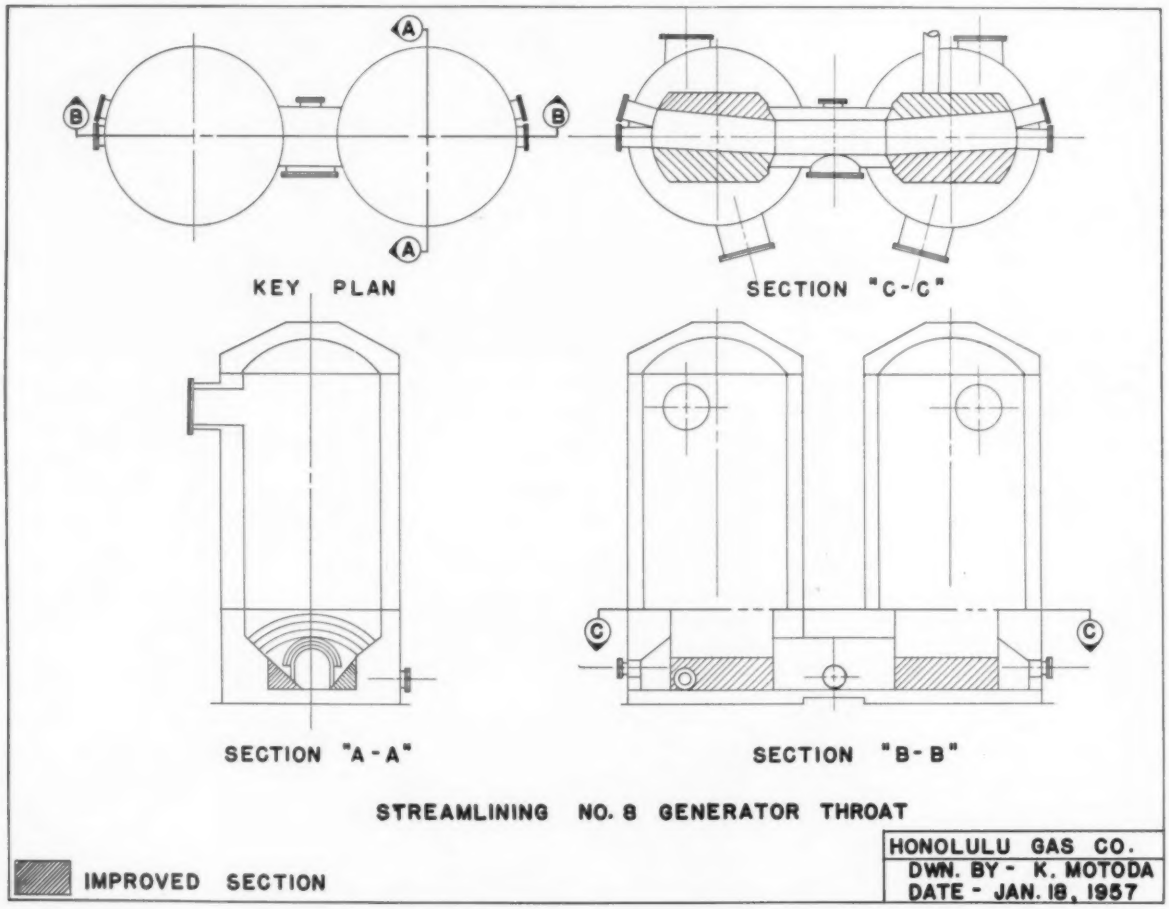


Fig. 10. The above line drawing is generally typical of Gasco generators. The shaded areas indicate how loose firebrick faced with plastic refractory was installed to eliminate, in so far as practicable, unnecessary space in the under-arch sections. This "stream-lining" has had a remarkable effect in reducing carbon deposits and eliminating generator smoke.

the steam-atomized oil sprays were causing a good bit of the trouble. Five of them were radially mounted in the upper part of each make chamber, and their patterns invariably impinged on sidewalls despite all our efforts. A single mechanical atomizer injecting down the vertical centerline of each shell offered a promise of relief but the physical difficulties of design and installation had kept us from pushing the project.

At the time, the plant supervisory staff was undergoing training in fire-fighting at the U. S. Navy school at Pearl Harbor. Pairs of supervisors in turn went for a week each. One such pair—members of the genius department—found themselves imagining a 3-in. fog-nozzle, shown in a Navy fire-fighting film, spraying oil from the top center spot of our generator shells. The idea looked good, and as soon as we could import a couple of the nozzles we installed them *(Figs. 7 and 8)*. The result was simply tremendous! Discharging from a point on the vertical center line of the generator shells, the new atomizers distributed the make oil evenly over the checker brick and kept it away from the sidewalls *(Fig. 9)*. Except for a deposit of oil ash the sidewalls look almost like new after three years operation. Even the checkers themselves have stood up better and have remained open and active over their entire area. The saving in high-pressure steam has amounted to 20 per cent of the entire plant consumption.

A third highly effective step in maintaining generator cleanliness was taken in 1956. It consisted of streamlining the bottom under-arch generator areas so that they become ducts and not just spaces arising out of and determined in shape by other structural features *(Fig. 10)*. Sloping sidewalls carry the gas as it comes down from the checkers into the center of the under-arch chamber from where it flows straight through the throat, into a similarly streamlined under-arch area in the opposite generator shell, and up through the checkers on that side. No low velocity pockets are left where coke, oil ash, and slag may collect. One generator has operated with this modification for eight months at as high or higher make rates than we have ever before used and smoke conditions have consistently been excellent. By "excellent" I mean a brownish or light-gray burst of smoke lasting from 4 to 5 seconds *(Fig. 11)*. A few years ago we were satisfied if we could hold our smoke bursts down to 15 seconds in duration with color varying from brown to *black*. The last of our generators to receive the under-arch streamlining has been operating for almost three months and its "stacks" are so clear that they are often difficult to see from outside the plant.

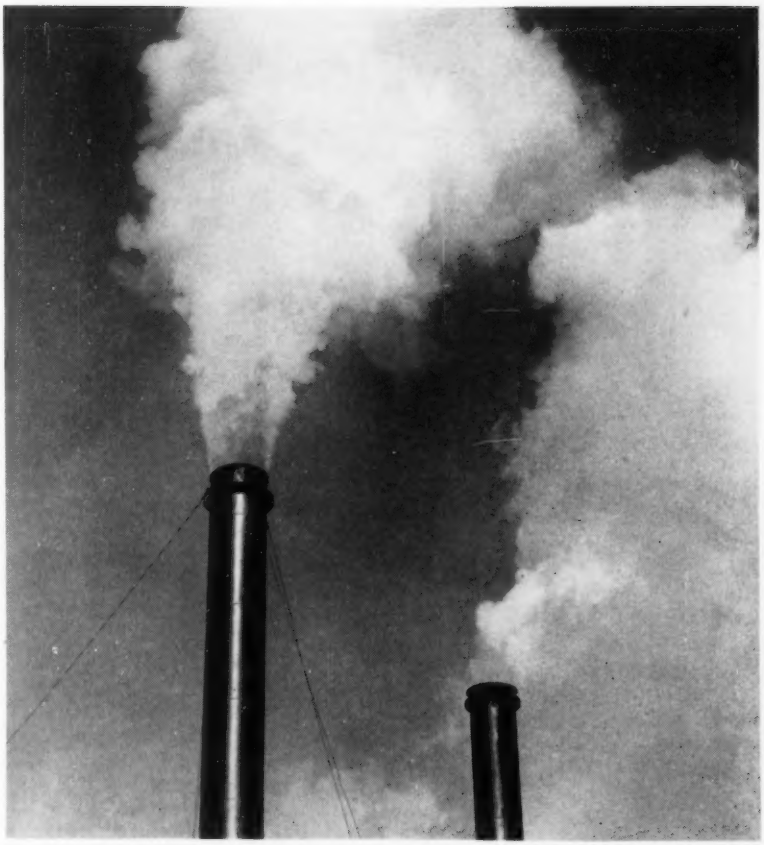


Fig. 11. The smoke burst or "stack" from No. 8 Generator. Since the picture was taken through a yellow filter (to darken the sky) and the smoke itself is a light yellow, the smoke and a white cloud (lower right) look very much alike. To the naked eye the smoke is much less apparent and dissipates rapidly. Each normal burst lasts for less than 5 seconds and follows immediately upon the opening of the stack valve.

Coupled with the foregoing, two other projects have contributed substantially to our present satisfactory operating condition. One has been a complete revision of the blast air system which removed the labyrinthine kinks of years of Topsy-like growth and increased air flows up to 25 per cent. The other has been a constant program of trying minor cycle changes, varying rates and times and injection points for steam, oil, air and particularly low-pressure purging steam. Bit by bit we have been able to reduce back-pressures, increase oil rates, purge more completely, make more homogeneous products, reduce the heat load on the scrubbers and save low-pressure steam.

As a result our plant today is relatively clean and smokeless and quite efficient. Ahead of us lies an acid-treating plant for benzol-purification, a program of further developing tar products, and a drive on plant noise. Provided, of course, that we don't find natural gas in the bottom of one of our volcanoes. ■

PEAK SHAVING

Plant stores refrigerated propane at -46 degrees F

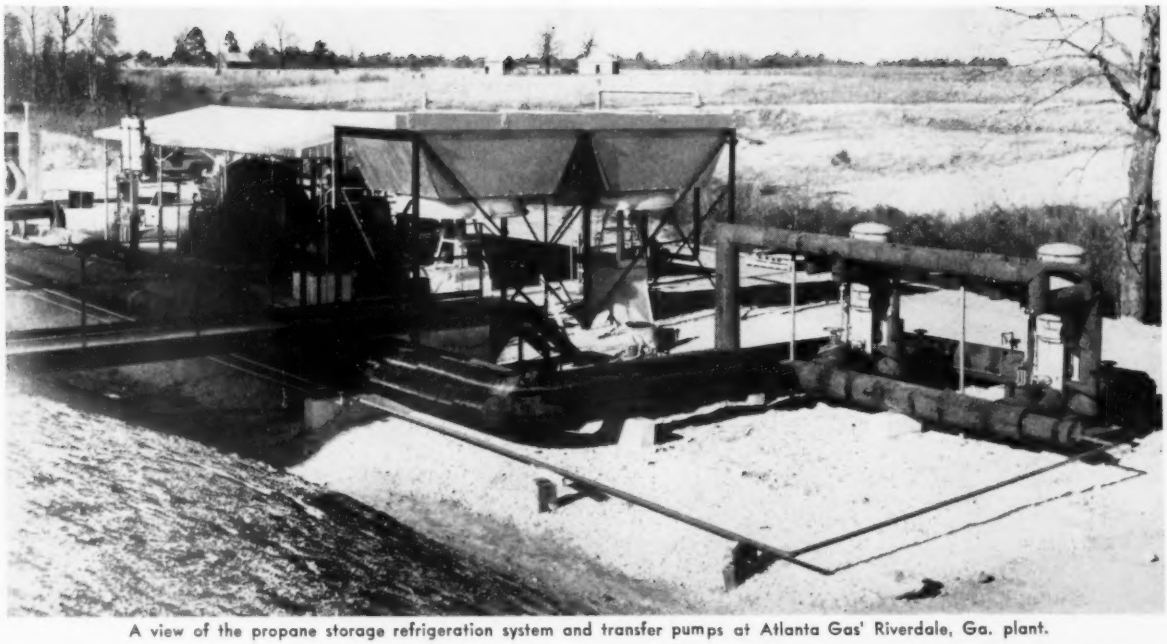
Overall view of propane-air plant during construction.

Atlanta Gas Light Co. has added a propane-air plant to meet heavy winter heating demands. It helps the company make peak day sendouts of 503 MMcf.

By B. C. WHITE, Project Engineer
Stone & Webster Engineering Corp., Boston

THE Atlanta Gas Light Co. serves 49 communities in Georgia. Of these, the majority receives natural gas. The largest consumer area is that of Atlanta and its suburbs. The latter territory has been growing rapidly and, at the present time, has a peak day consumption of about 503 MMcf. There is a large percentage of house heating in this area, which introduces a great variation in gas consumption with changes in the ambient temperature.

At the present time, cold weather demands for gas in excess of the contract quantities are supplied by the gas company plant, located on one of the principal gas feeder mains southeast of the center of Atlanta. However, increasing quantities of gas are delivered through another feeder originating at Riverdale, Ga. The gas company plant has a large sendout capacity and ample storage for propane in conventional pressure tanks located both above and belowground, but the use of this peak shaving facility is now limited by the gas taken through the feeder on which it is located. In 1955 a study by Atlanta Gas Light Co. and Stone & Webster Service Corp. engineers showed the desirability of erecting a second peak shaving plant at Riverdale.



A view of the propane storage refrigeration system and transfer pumps at Atlanta Gas' Riverdale, Ga. plant.

The gas company decided that large volume refrigerated storage of propane offered many advantages for this plant and initiated discussions with the Georgia state fire marshal to obtain his approval. After several meetings with the fire marshal, his advisory board and the national Fire Protection Association's subcommittee on gases, approval was granted for the installation of this plant.

The plant site is located about six miles south of the Atlanta city limits and ample space is available for expansion. The land is gently sloping, permitting the plant to be arranged with the propane equipment below the air compression equipment and general facilities.

The propane storage installation has a water capacity of 1,150,000 gal. The tank is a cylinder, 70 ft in diameter and 40 ft high, with a flat bottom resting on the ground and a domed, self-supporting roof. The tank, fabricated of A201, grade B, aluminum-killed steel, is designed for a pressure of 1.5 psig and a temperature of —50° F. It operates at 0.5 psig and —46° F. All welds have full penetration and were completely X-rayed. Before placing the tank in service it was filled with 36 ft of water, and compressed air was pumped into the space over the water to a pressure of 1.5 psig.

The entire tank is insulated with Foamglas, 8 in. thick beneath the bottom and 7 in. thick on the sides and roof. The Foamglas insulation, spaced ½ in. from the tank shell, rests on the roof. It is applied in two layers, and the second layer is sealed to provide a moisture barrier. Over this insulation, an aluminum jacket is provided to form an additional seal to minimize maintenance on the surface, and to reduce painting costs.

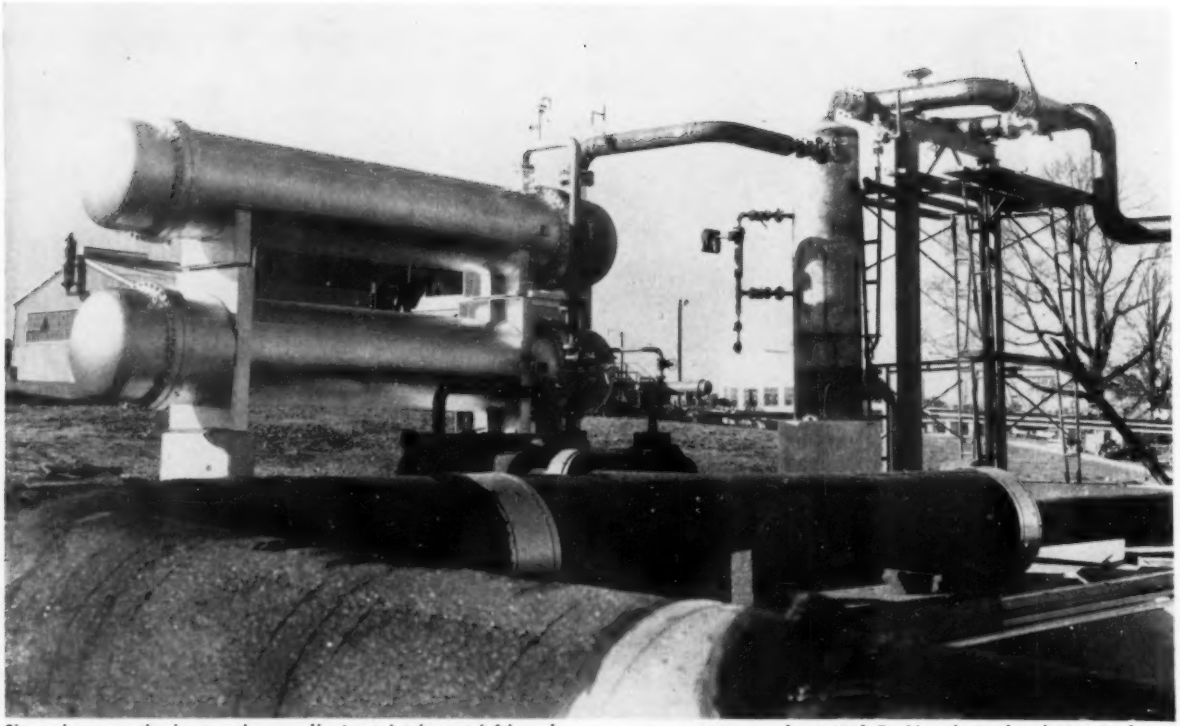
In normal storage, with the tank full of liquid propane, vapors are withdrawn from the top of the tank by the refrigeration compressor, which is driven by a 50-hp motor. The vapors are then compressed to 230 psig and condensed in an air-cooled condenser. The liquid propane, condensed under these conditions, is returned to the top of the tank where it is expanded at a pressure control valve which maintains the back pressure on the compressor. In this valve, the propane liquid is reduced in pressure and temperature to the storage conditions in the tank, with approximately 50 per cent of the liquid flashing to vapor. The vapor is recycled to the compressor for further refrigeration.

During the filling operation, additional propane is introduced at the top of the tank through a flow control valve. A large portion of the liquid introduced at this point flashes to vapor, which is returned to the suction of the compressor. A second and larger compressor, driven by a 150-hp gas engine, is arranged to cut in and is sized to handle a propane filling rate of 25 gpm under summer conditions. This larger unit also serves as a stand-by compressor for the smaller one. The vapors from this larger compressor are combined with those of the normal refrigeration compressor for condensation in the air-cooled unit.

The air-cooled condenser has two fans, each driven by a 15-hp motor. One of these fans is arranged to start when the 50-hp compressor begins operation, and the other fan is set into motion when the large filling compressor becomes loaded.

The operation of the 50-hp compressor and the filling compressor is controlled by two pressure switches arranged to step these compressors into operation in sequence as the pressure rises at the outlet of the propane condenser. A small accumulator is provided.

Noncondensible gases are with-



Shown here are the heat exchanger (horizontal tubes at left) and separator (right). Heat exchanger cools compressors and warms propane vapors to about 100° F. Heavily insulated pipe in foreground transports liquid propane at —46° F from storage tank.

drawn from the top of this accumulator and returned to the fuel gas system for use in the pilot lights provided around the dike and in the water heater.

In designing the installation, which is located 1000 ft from the two nearby state highways and 500 ft from the sendout facilities, the hazards of a major spill of propane are taken into account. It is believed to be better practice to provide for ignition of the propane immediately, while it is within the diked area, rather than to permit propane vapors from such a spill to drift down wind and become ignited at some remote point where such vapors might endanger a considerable area. To ignite the propane from such a spill, pilot lights have been provided at each corner of the dike and at the mid-point in each side of the dike. This dike encloses a volume 50 per cent greater than the tank contents.

Although there are 8 in. of insulation beneath the storage tank which is resting on the ground, it is considered advisable to provide some heat beneath it, in order to keep the earth from freezing. For this purpose, a pipe coil is buried in the foundation and a glycol-water solution is circulated through this continuously and heated sufficiently to maintain the ground temperature at 40° F.

A stairway starting from the top of the dike provides access to the top of the tank and terminates in a platform at the side of the tank roof, around which all of the operating controls and valves are grouped.

For the remote possibility that all of the refrigeration system might fail, a small flare line with a flare stack 25 ft high is provided at a point distant from the operating area.

When the liquid level in the tank reaches the maximum capacity, a float switch at the top of the tank closes a solenoid valve in the propane filling line.

Propane for filling the tank is received at a siding in Jonesboro, about five miles to the east, and transferred to the storage site through a 3-in. transmission line. At the unloading siding, two conventional pressure storage tanks are provided into which tank cars can be unloaded during the daylight hours, while the liquid is withdrawn from them continuously for transfer to the storage site. Two 10-hp unloading compressors are available for unloading tank cars and for maintaining pressure on the propane tank from which liquid is being withdrawn. The siding at this location can accommodate 10 tank cars.

The sendout and mixing facilities located at this plant provide for a sendout rate of approximately 2.17 MMcf/hr of natural gas equivalent. Since the mixture found to be most acceptable for this system is 1450 Btu/cu ft, air compressor capacity is provided for 12,650 cfm. This air compression capacity is divided between two 1500-hp, 250-rpm Cooper-Bessemer air compressors which compress the air to 140 psig in two stages. These compressors can be manually unloaded to 50 per cent of capacity, and their speed can be reduced to 60 per cent of full rating for capacity control. The speed of these units may be controlled either locally or remotely from the board in the control house. These compressors are driven by 2-cycle natural gas engines with directly connected superchargers. Each engine drives its own jacket water circulating

pump and these pumps discharge into a common cooling system. In this system, water is circulated through a jacket water-cooling water exchanger, where heat is extracted from the jacket water, to the engine oil coolers and back to the engines. From the engines, the water flows to a surge tank and thence back to the jacket water pumps. Some of the hot water discharged from the pumps is by-passed to the engine jacket inlet to temper this water to the correct operating temperature.

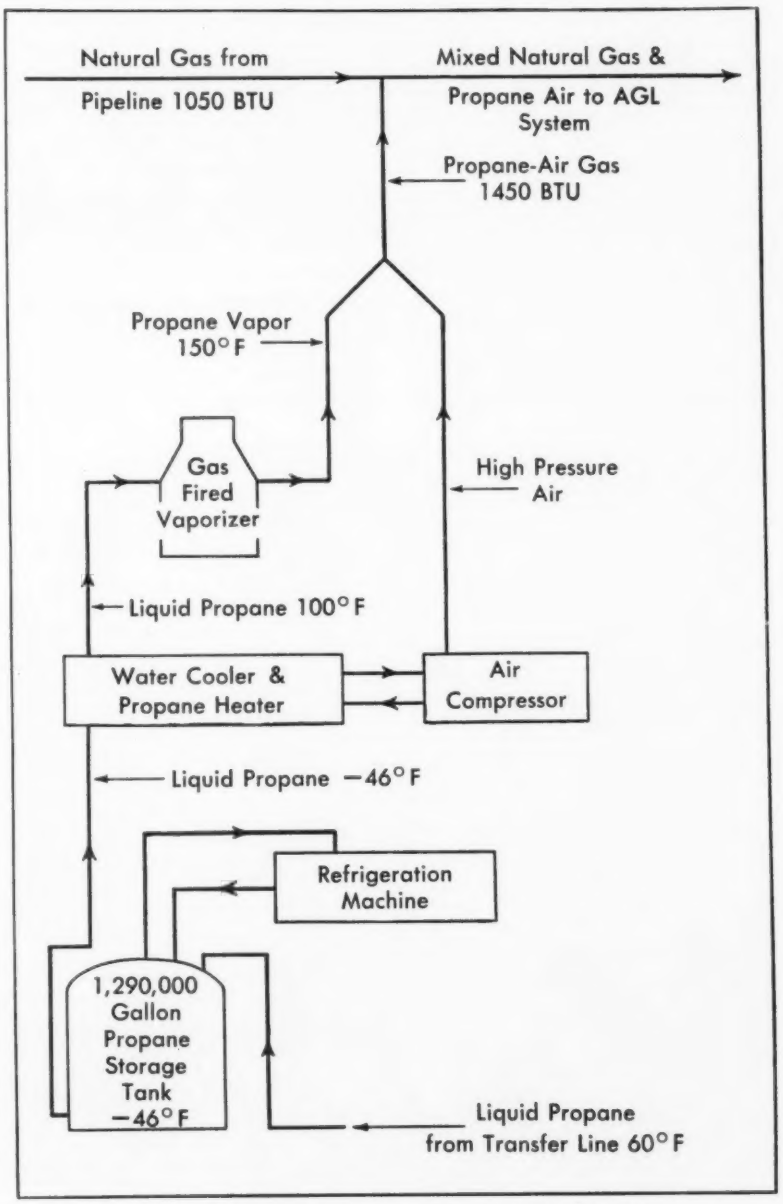
In event that sufficient heat cannot be removed in the jacket water-cooling water exchanger, the water may be passed through an air-cooled, jacket water cooler. In the cooling water system, water from the jacket water-cooling water exchanger flows into the air intercooler and air aftercooler in parallel, and then into the propane-cooling water exchanger. From this exchanger, the water flows back to the surge tank, then to the cooling water circulating pump which discharges to the jacket water-cooling water exchanger. Some of the water leaving the air intercoolers is circulated through the air compression cylinder jackets and returned directly to the cooling water surge tank.

Propane to be sent out flows from the bottom of the storage tank into two vertical liquid-propane, deep well pumps operating in parallel. Each unit, capable of pumping 240 gpm at 203 psig, is driven by a 50-hp explosion-proof motor. Liquid from these pumps flows first into the propane-cooling water exchanger where it is preheated from —46° F to its bubble point; approximately 10 per cent of it is vaporized. This mixture is separated in a vessel adjacent to the exchanger. From this separator the liquid flows into the two direct-fired vaporizers in parallel. The vapor bypasses the vaporizers to flow directly into the propane vapor header.

The direct-fired vaporizers, rated at 12 MM Btu/hr each, are manufactured by Petro-Chem Development Co. Inc. They are of the all radiant type, fired by natural gas. The natural gas fuel is regulated by a temperature controller located in the outlet of each vaporizer. This controller is set to maintain a moderate superheat on the propane leaving the vaporizers.

The fuel supply to each vaporizer is further monitored by conventional combustion controls which will shut down the gas flow in event of flame failure. The power for these combustion controls is taken from a 1-kw motor-generator set with flywheel. This motor generator set assures continuity of electric power supply to the controls and eliminates false trip-outs of the controls caused by power flickers and minor interruptions. A heavy flywheel incorporated in this unit assures that power will be delivered by it for at least 20 seconds after a power interruption.

Propane vapor leaving each vaporizer passes through a knockout pot on which is located a level control. If, for any reason, there is liquid carry-over from the vaporizer, the level control will discharge small quantities back to the storage tank and, if the level



Simplified diagram shows flow of propane at Riverdale plant.

continues to rise, will shut off the liquid feed to the vaporizers. The liquid feed to the vaporizers is regulated by a flow controller located in the control house. This flow controller can be set to maintain any flow desired. It is the only control on the propane vaporizing rate.

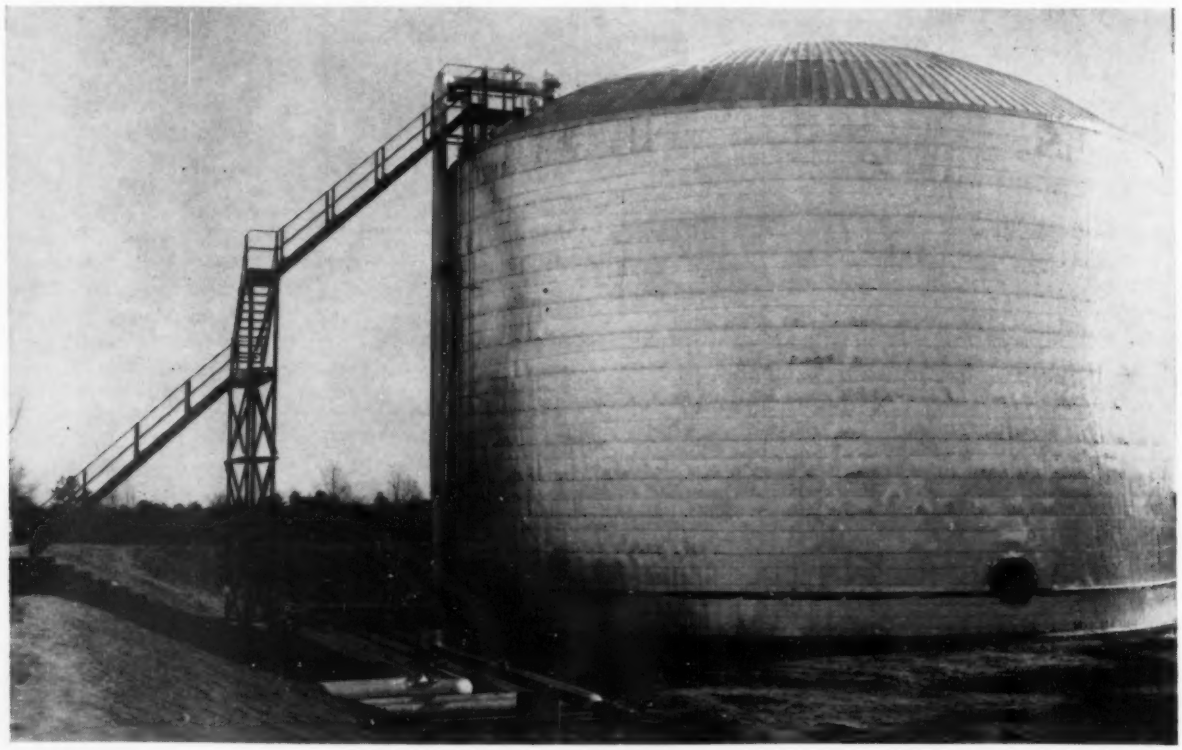
Mixing of the propane and air is controlled manually from the control board by varying the speed of the compressors and by varying the control point on the propane flow controller. An air flow recorder, provided in the control house, and the propane controller are sized so that the heating value of propane-air mix will be approximately 1450 Btu/cu ft when the pens are in the same relative positions on the scales. The heating value of propane-air mix is continuously recorded on a Cutler-Hammer calorimeter. When the record has stabilized, the proportions of propane and air may be varied manually as desired. An atmospheric relief valve, regulated from the control board, is provided for low and some intermediate flow rates which are outside of the range available on the air compressors, and for operation of the air compressors during the summer without mixing propane and air. This is a standard control valve with air from the control board piped to its diaphragm. The discharge from this valve passes through a silencer, which reduces the noise level to an acceptable value. This valve is of the air-to-close type. A solenoid valve has been provided in the air supply. In event that the mixed-gas heating value becomes too low, a Caloroptic safety control will first sound an alarm. Then, if the heating value continues to drop, the safety control will release the solenoid valve, permitting the air relief valve to open and bleed excess air to the atmosphere. These controls will reset themselves when heating value of the mixture has been corrected.

Instrument air for the plant is supplied by a 15-hp air compressor with a receiver capable of supplying 40 cfm at 75 psig. The instrument air is passed through an oil absorber and an air dryer before going to any instruments.

Starting air for the two process air compressors is supplied from three 250-psig tanks, 46 in. OD by 10 ft high. These tanks are filled by a 15-hp starting-air compressor. Both the instrument air compressor and the starting air compressor are automatically controlled by pressure switches on the receivers. After one process air compressor is started, starting air receivers may be refilled rapidly through a cross connection from the process air header to the starting air receivers. A check valve in this cross connection will not permit starting air to flow into the process air system.

A 250-kw, 440-v, 3-phase, 60-cycle, gas engine-driven, emergency generator is provided to permit the plant to be operated during periods of power interruption. This unit will automatically start and pick up the load after a power interruption of a few seconds. It is selected to carry all of the necessary process controls and either the refrigeration equipment, sendout equipment or one-half of the future design capacity of the plant.

Allowance is included in the layout of the plant for doubling its present capacity. ■



Propane storage tank has water capacity of 1,150,000 gal. Tank is 70 ft in diameter and 40 ft high.

ODORIZATION of a converted oil-gas system

By DON WRIGHT • Managing Editor

Portland (Ore.) Gas & Coke Co. converted its system to natural gas last fall, when the Pacific Northwest Pipeline Corp.'s *Scenic Inch* brought this fuel to the area for the first time.

The Portland Gas system had distributed manufactured oil-gas to its customers for a half-century. Consequently, while using this manufactured gas, the company had no need for odorization. With the introduction of the San Juan basin natural gas into the system, odorization became a necessity.

The company still uses some manufactured gas. A low pressure system which serves the central and major portion of the city of Portland and some parts of the high pressure system distributes mixed gas which averages approximately 75 per cent natural and 25 per cent manufactured. Low-pressure lines serve about 68,000 customers.

The remaining intermediate and high pressure distribution systems in Portland and nearly towns, and separate distribution systems in Vancouver, Wash. and Camas, Wash. are on straight natural gas. These serve about 20,000 customers.

Separate odorization stations have been installed by Portland Gas at the three points where the company takes delivery from Pacific Northwest. One is located at the Portland city gate station, another at the Vancouver city gate station, and the third at the Camas gate.

The Portland station odorizes between 40 and 45 MMcf/day during winter months, with a peak-day load exceeding 50 MMcf. Gas is delivered to this station by Pacific Northwest at a minimum pressure of 400 psig. The Camas station is handling 10 MMcf/day, but has been designed to handle an ultimate capacity of 20 MMcf/day. Delivery pressure is 300 psig minimum. At Vancouver, the delivery is 3 MMcf/day, at a minimum pressure of 400 psig.

The Portland and Camas odorization stations are similar in design. Both are Peerless type MP injector stations. The Vancouver system is odorized by a by-pass odorizer. This by-pass odorizer is a 24-in. x 6 ft tank, and operates on vaporization. Portland and Vancouver stations were designed by United Engineers, Philadelphia, a consulting firm which was employed by Portland Gas to help with its construction program. The Camas station was designed by the engineering department of the gas company.

Because of occasional periods of freezing temperatures during the winter in Oregon and Washington, special care was taken in designing the odorization stations to prevent freeze-ups. A liquid-dust trap has been installed on the ¾-in. incoming piping of the Portland and Camas odorizers. This trap consists of a small baffled bottle, installed in front of the precision valve on the odorizing equipment. Such a trap has not been needed for the by-pass type unit at Vancouver, as there has been no indication of stoppage in the precision valve.

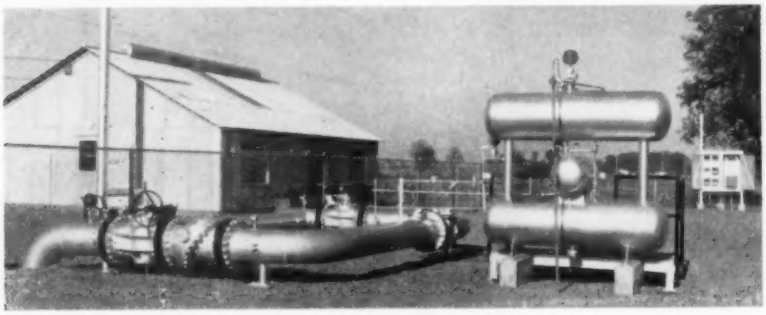
As another precaution against freezing, Portland Gas has heat lagged the incoming and outgoing piping and meter dome of the odorizer, and also wrapped them with heating coils which are thermostatically controlled.

Portland Gas & Coke Co. has

Portland Gas & Coke Co. odorizes natural gas from "Scenic Inch" at this city gate station. Odorization equipment is shown at left rear.

selected two types of odorant for use in its systems. The injection type odorization stations at Portland and Camas use Natural Gas Odorizing Co. (Houston) RP Captan odorant; at Vancouver, BP Captan is used in the by-pass station.

The company has found that it can get a satisfactory odor level in its systems by using between 0.5 and 0.65 lb. of odorant/MMcf of gas. This has been holding true even in the Willamette Valley system, which is served by a line extending some 70 miles southward through Salem, Ore. to Lebanon and Corvallis from the odorization station. The company has run extensive tests on this line, and all have shown that a sufficient odor level is maintained at the end of the system. The company originally had intended to install an odorization booster station on the Valley line; however, this plan has been dropped since no noticeable odor fade has been found.



Another view of the odorization equipment at the Portland city gate station.

The company also has found that the mixing of high Btu manufactured oil-gas and natural gas has posed no odorization problem. The natural gas is odorized before it reaches the company's mixing station at the manufacturing plant in the Portland suburb of Linnton. Two feeder lines, one serving the Willamette Valley, and the other a high pressure distribution system in suburban Portland, branch off before the mixing point.

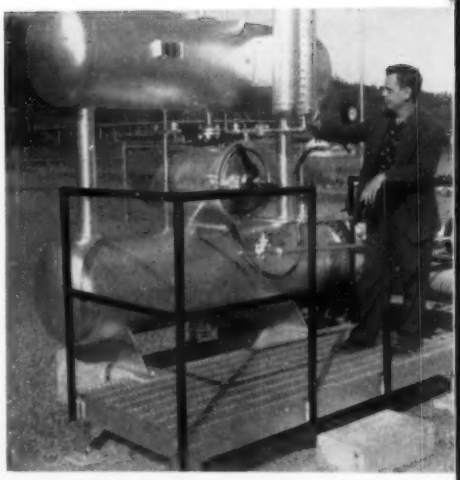
It had first been thought that separate odorization facilities would have to be installed on each of the lines, to avoid an expected double odorization in the mixed gas system. However, working experience with the mixed gas has shown that the oil-gas masks the mercaptan used in the natural, without intensification and actually helps to control the odor level. The mixed gas is distributed principally through the low-pressure system in central Portland.

Another problem that confronted the company was the possibility of odor fades in the old low-pressure system—a system that was known to be dusty. The company has set a maximum of 0.25 per cent of gas in air as the level of odor required to identify gas. Actually, in nearly all parts of the system, a 0.15 level is maintained. Only in one of the 25 sections in the low pressure system is fading even noticeable, and in this it is not sufficient to cause any concern.

Before natural gas was turned on, company officials anticipated that it might be necessary to maintain an excessively high odor level in several sections in order to keep it at a satisfactory level in some of the dustier sections. Fortunately, this is not the case.

Checks on the systems' odor levels are made periodically by the Portland Gas' customer service department personnel. Inspectors use Warren M-4 odorometers for this work. The result of each test is sent to the distribution engineering department, where it is recorded and filed. In this manner, the company is able to keep a positive record of the odor level in all parts of its system.

If readings above the standard 0.25 level were to be recorded in any section, immediate steps would be taken to determine the cause and extent, then remedy it.



Engineer Frank Zitzo of Portland Gas & Coke Co. inspects odorization station at Portland city gate.

As is the case in any converted system, odor calls from customers came in at a rapid clip when natural gas began flowing through the mains for the first time. This heavy barrage of calls continued for several weeks after the conversion was made. A number of these calls were attributable to a new odor. Now, the odor calls have levelled off to a daily average of about 1 per 1000 meters.

The company's records show that Monday is the big day for odor calls among its 88,000 customers—about 15 per cent more come in on this day than any other. They taper off during the week, and are practically non-existent on Sunday. This is probably due to the fact that most customers do not believe the gas company would answer Sunday calls—a misconception. Hence, most of the Sunday odor complaints are held back by customers until Monday.

Probably Portland Gas' biggest problem with odorization following conversion to natural gas was in educating the public to the different odor of the gas. Manufactured gas used for many years in the Portland Gas' systems had its own odor.

When natural gas with the added odorant was first introduced, many people were able to detect extremely small leaks in house piping because of the unfamiliar odor. ■

GAS exclusive

Tally it—but don't touch it

By **CHARLES M. SHIBEL,** Southern California Gas Co., Los Angeles

Here is a method for counting large items like steel pipe without touching the material. This report tells how a gas company adopted the weight ratio method in its pipe yard with great success.

THE technique of counting small bulk items by ratio weighing is well known, and is widely used by industries that deal in small parts such as screws, bolts, nuts, washers, and the like. Is the reasoning behind this method applicable in some form to the manufacturer, the seller, and the buyer of large parts which are also handled in quantity form? Can the weight-count technique be adapted for use on large items such as steel pipe? This article is a discussion of the results of such a study.

Each year the Southern California Gas Co. (Los Angeles) receives several million feet of bare pipe to be wrapped with a corrosion-resistant protective coating before being installed into the natural gas distribution system. The problem centered around the "small pipe," nominal diameter sizes ¾-in., 1-in., 1¼-in., 1½-in., 2-in., 3-in., and 4-in. single random (approximately 21 ft in length). Numerically this group represents the bulk of the pipe footage received.

Pipe is generally accounted for by the linear foot, and it is customary practice among many gas utility companies to tape-measure every length of pipe received. This is necessary because of variations from the nominal or desired length of 21 ft 0 in. However, recent mechanization of the Southern California Gas Co.'s pipe wrapping process made it essential to use only pipe with a very small variance from the standard length. Pipe purchased under these new specifications has shown sufficient uniformity in length to enable the substitution of counting for tape-measuring. The footage of pipe received is obtained by counting the number of joints received and multiplying by the standard length, 21 ft 0 in.

In 1954, the Company purchased over 4.5 million ft of "small pipe" which weighed about 8.5 million lb at a cost of approximately $1 million. For inventorying and accounting purposes every joint of this pipe was counted prior to wrapping. This means that over 200,000 joints of pipe were physi-

Fig. 1. First method used by Southern California Gas Co. was the wooden peg technique.

cally counted. The methods used to obtain this 100 per cent tally were slow, cumbersome, and costly. With the gas distribution network continuously expanding, it became evident that the pipe tallying program needed further revising.

Objective:

A method for tallying bare "small pipe" received at the pipe yard that will minimize physical handling, time and cost, and still maintain accurate count control.

Recommendations:

1. Stop the physical tallying of every joint of bare pipe received.

2. Substitute weight-factor tallying wherever possible.[1]

3. Use physical tallying only when weight-factor tallying indicates the need for it, and also as a sampling check to maintain a control.

Benefits:

1. Tallying by weight-factors will minimize physical handling, time and cost without loss of count accuracy.

2. The company can satisfactorily weigh-tally over 90 per cent of the "small pipe" that is delivered to the yard within one hour after it is trucked in as compared to numerous hours required for physical tallying.

3. The number of storeroom keepers presently assigned to inventorying pipe will be ample, despite the continuing heavy increase in the amount of pipe processed.

4. A means of quality control to insure proper pipe wall thickness[2] will be automatically accomplished.

5. By decreasing the amount of handling necessary to make a tally, the pipe is less susceptible to damage.

[1] It is estimated that less than 10 per cent of the pipe received will require a physical tally either for control purposes or for tally check.

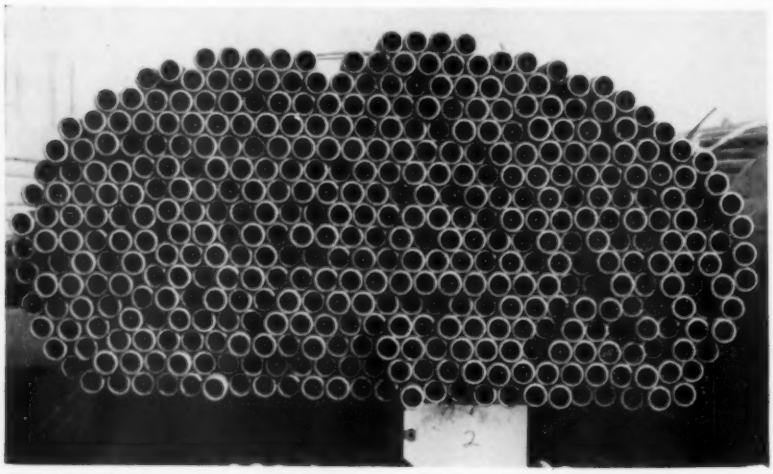


Fig. 2. In photographic method, storekeeper counts pipe from picture.

Procedure:

"Small pipe" is principally purchased from local vendors who deliver it at the pipe yard on flatbed trainer trucks. In the sizes ¾-in. through 1¼-in. the pipe is wire strapped in bundles of 1 to 5 tons. Pipe sizes 1½-in. through 4-in. (single random) are delivered loosely stacked on similar flatbed trailer trucks.

In the past, the storeroom keeper met the incoming truck and directed the driver to a laydown area set aside for untallied pipe where the crane crew unloaded the truck. After the storeroom keeper had completed his tally, the crane crew picked up the pipe and moved it to the pipe laydowns which supply the wrapping machines.

Wooden pegs about 12 ft long, 1-in. in diameter, and tapered at one end were used to tally pipe sizes ¾-in. through 1¼-in. (see *Fig. 1*). Starting with a known number of pegs in a box the storeroom keeper inserted one of these pegs into the end of each joint of pipe. Having done this, the storeroom keeper arrived at his tally by subtracting the remaining number of pegs from the known quantity with which he started. The amount one storeroom keeper could tally per day in this manner ranged from 4000 to 5000 joints. Since there are times when 15,000 to 25,000 joints are delivered in a day, it would keep sev-

[2] Pipe walls thinner than specified reduce the safety factor against rupture under full gas load pressures.

eral storeroom keepers busy the whole day to complete the tally or it would require several days whenever an insufficient number of men were available.

Because pipe sizes 1½-in. through 4-in. are delivered unbound or loose the pipe was tallied while it lay on the truck bed to reduce the amount of bent pipe and damaged ends which might result from too much handling. Damaged pipe, as such, is unfit for wrapping. As the storeroom keeper visually counted the pipe, he chalk marked the end of every fifth joint as a check against his count.

A method to handle all single random pipe sizes ¾-in. through 4-in. was needed and several were considered.

Method I—Do Not Tally

The vendor supplies a delivery ticket bearing the net weight and pipe tally with each load—accept it as being correct. To check this possibility a historical record was compiled to estimate the dollar loss in pipe not received had tallies not been made by the company. The total loss for that year would have been less than $1000 worth of pipe. It cost the company many times that amount in storeroom keepers' wages alone. However, sound business judgment would not permit total reliance on historical records. The value of such records would only be as valid as the correlation between the records and current practice. Then, too, gross errors such as unspecified length tolerances might elude detection during receipt of the shipment.

Also, good business management would dictate that some means be provided to assure value received before making disbursements.

Method I was ruled out.

Method II—Tally With Pictures

This method is simple enough in theory. The pipe arrives at the yard, a photographer takes a picture of each bundle or truck load, and a clerk of any sort can be handed an automatic hand counter equipped with a needle for pricking each pipe end which appears on the print (*Fig. 2*).

Tally it . . . The weight count technique is brought into consideration

The Land polaroid camera produces a ready made print and so it was considered the most suitable for use at the pipe yard. The sub-foreman in charge of receiving pipe could be trained in the use of the camera, and he could photograph the pipe shipments as they were received. To facilitate the tally it would be necessary to increase the size of the 3¼-in. x 4-in. picture by some means of magnification.

To further evaluate picture tallying as a method requires an analysis of the two ways in which "small pipe" is received at the pipe yard.

Wire strapped bundles — pipe sizes ¾-in. through 1¼-in. When bundled pipe arrives the crane crew is called upon to unload the truck, swing the bundles against a steel plate to get the pipe ends aligned, and then stack the pipe so as to facilitate photographing. The bundles are photo-identified by a tag number attached to the bundles and are held in the untallied laydown area until the count is completed. Approximately four bundles of ¾-in. pipe can be counted per hour using this method, which is about three times the rate for tallying with pegs.

Unbound, loosely stacked pipe sizes 1½-in. through 4-in. single random. In the case of loose loads, the pipe has to be photographed while still on the truck, because it would be too difficult to isolate a segment of pipe which was part of a laydown stockpile. Taking pictures of pipe on a truck poses a problem too. There is the possibility that some of the pipe ends will be out of alignment enough to be out of camera view.

Where applicable, this method of tallying is superior to physical tallying in that it is faster, more economical, and is equally as accurate. The special handling required of the crane crew to prepare the pipe for photographing makes this method about as burdensome as physical tallying. Although picture tallying was a partial answer to the problem, it didn't size up to the terms of the objective. At this point the weight-count technique was brought into consideration.

Fig. 3. When weight ratio method is used, incoming loads are weighed when they arrive in pipe yard.

Tally it . . . Tables for each pipe size and wall thickness were devised

Method III—Tally Pipe By Weight-Factors

To do this, the statistical approach was employed. Certain factors were known to be fairly consistent, for example:

Pipe is purchased according to specifications established by the American Petroleum Institute, a recognized authority for pipe specifications. Pamphlets issued by API specify wall thickness, pounds per linear foot, and the allowable weight tolerances for each of the pipe sizes.

A distribution curve[3] was applied to a number of joints of each of the "small pipe" sizes to determine the average length, and also the extent and distribution of the variations in length (in inches—plus and minus). Analysis of the results indicated that for tallying purposes 21 ft 0 in. could be considered the length of each joint.

To utilize the weight-count technique required that a control be set on the pounds per foot of pipe factor because this weight varies, even within the same length of pipe. This is caused by the variation in the wall thickness throughout the length of a joint, a condition inherent in the manufacture of pipe. API specifications provide a maximum allowable deviation from the given lb/ft which provision was used to establish the "lower limit"[4] or minimum weight per 21 ft 0 in. joint which would be considered acceptable (see *Table 1*).

The upper limit of allowable weight deviation was not included in the weight-factor technique because a tally of pipe weighing in excess of the specified amount could mean chiefly two things:

1. The shipment contained more joints than the vendor's tally indicated.
2. The wall thickness was running on the heavy side.

The company was not being jeopardized in either case.

However, the possibility of excessive overweight, and thus too heavy a wall thickness, must still be considered. The provisions for checking this are as follows:

1. The storeroom keeper would notify the sub-foreman if the actual net weight exceeded the minimum weight by more than 5 per cent.
2. The sub-foreman would check the API upper limit specifications to determine acceptability.
3. The pipe inspector would take a sampling of wall thickness micrometer readings to verify the sub-foreman's findings.

To make this technique usable, a set of tables was compiled listing the minimum weights for any number of joints. The tables are made, one for each pipe size and wall thickness. In each table heading, the pipe size, the wall thickness, and the pounds per foot according to API specifications are identified. Also listed is the "lower-limit" factor used in compiling the tabulated data. The table itself is a list of the number of joints increasing in order from 1 to 100 and then in multiples of 100, and the minimum allowable weights per each count.

As a load of pipe enters the yard, the truck is driven on top of the ground level platform scale[5] and the gross weight is recorded on a scale ticket (see *Fig. 3*). After weighing in, the trucker drives to the "ready for wrapping" pipe laydowns where the crane crew unloads the pipe. The trucker then drives his truck back onto the platform scale where the tare weight is recorded on the same scale ticket. Subtracting the tare weight from the gross weight provides the weigher (storeroom keeper) with the net weight, or the weight of the pipe delivered.

[3] A graphical means of showing the distribution of values on both sides of a given point, in this case the variation in inches of pipe lengths above and below 21 ft 0 in.

[4] A weight variable which may be adjusted to make the most of the vendor's reliability, or to prevent company acceptance of pipe which does not meet specifications.

[5] The platform scale in use is marked in increments of 20 lb and is accurate to within 11 lb. A single joint of ¾-in. pipe will tip the scale.

TABLE 1. LOWER LIMIT WEIGHT FACTOR TABLE FOR STEEL PIPE—NOMINAL SIZE ¾-IN.

Wall: 0.133 in.— Weight: 1.13 lb/ft
Length: 21 ft 0 in.—Lower Limit: 1.09 lb/ft (−3.5% Tolerance)

No. of Joints	Weight in Lb	No. of Joints	Weight in Lb	No. of Joints	Weight in Lb	No. of Joints	Weight in Lb	No. of Joints	Weight in Lb
1	23	26	595	51	1,168	76	1,740	100	2,290
2	46	27	618	52	1,191	77	1,763	200	4,580
3	69	28	641	53	1,214	78	1,786	300	6,870
4	92	29	664	54	1,237	79	1,809	400	9,160
5	114	30	687	55	1,259	80	1,832	500	11,450
6	137	31	710	56	1,282	81	1,855	600	13,740
7	160	32	733	57	1,305	82	1,878	700	16,030
8	183	33	756	58	1,328	83	1,901	800	18,320
9	206	34	779	59	1,351	84	1,924	900	20,610
10	229	35	801	60	1,374	85	1,946	1000	22,899
11	252	36	824	61	1,397	86	1,969	1100	25,189
12	275	37	847	62	1,420	87	1,992	1200	27,479
13	298	38	870	63	1,443	88	2,015	1300	29,769
14	321	39	893	64	1,466	89	2,038	1400	32,059
15	343	40	916	65	1,488	90	2,061	1500	34,349
16	366	41	939	66	1,511	91	2,084	1600	36,639
17	389	42	962	67	1,534	92	2,107	1700	38,929
18	412	43	985	68	1,557	93	2,130	1800	41,219
19	435	44	1,008	69	1,580	94	2,153	1900	43,509
20	458	45	1,030	70	1,603	95	2,175	2000	45,799
21	481	46	1,053	71	1,626	96	2,198		
22	504	47	1,076	72	1,649	97	2,221		
23	527	48	1,099	73	1,672	98	2,244		
24	550	49	1,122	74	1,695	99	2,267		
25	572	50	1,145	75	1,717				

The storeroom keeper has merely to look up the number of joints of pipe delivered as shown on the vendor's delivery ticket, and check it against the weight tables provided him to establish whether the net weight computed on the scale ticket is greater or less than the minimum weight allowed in the tables for vendor's tally. If the scale net weight is greater than the minimum weight shown in the table, the load is accepted (*Table 2*). If not, that particular load is earmarked for further check. Unaccepted pipe is either peg or visually tallied[6] to establish the actual tally and to verify the vendor's tally. Should the vendor's tally differ from the actual tally, the weight-factor tables are consulted for acceptance or non-acceptance of the actual tally. If the actual tally does not meet the acceptance standards, the storeroom keeper is immediately put on guard against an important specification violation—improper wall thickness.

As previously mentioned, the API pamphlet specifies the pipe size, wall thickness, the pounds per foot, and the allowable deviation in the weight. Weight differences are reflected in wall thicknesses, and pipe walls thinner than the specified minimum will weigh less than the minimum weight allowable. To check suspected pipe for excessive wall thickness variation, the pipe inspector takes micrometer readings on a sampling of pipe ends. Verification of improper wall thickness is sufficient reason to set that load of pipe aside for return to the vendor.

A safety measure was added to increase the reliability of the weight-factor tallying program. This consists of a random sample physical tally per vendor, approximately one bundle every three months of each of the ¾-in. through 1¼-in. sizes of pipe, and one truckload every three months of each of the 1½-in. through 4-in. single random sizes of pipe.

Conclusion:

Weight-factor tallying has been in use at the Southern California Gas Co. pipe yard for approximately 12 months. During this period approximately 6 million ft of ¾-in. through 4-in. single random pipe has been received at the pipe yard, none of which was rejected for not meeting the minimum allowable weight. There were a few recorded differences between the vendor's and the company's tallies, but in every case the net weight for the actual tally was acceptable (*Table 3*). This high degree of reliability is a credit to both the manufacturer and the distributor for maintaining excellent standards.

The time element has been licked too; bare pipe received at the pipe yard is no longer a bottleneck in production scheduling. The cost of tallying pipe has been minimized without sacrificing accuracy. A thorn in the material handling side of the Southern California Gas Co. pipe yard has been removed. ■

[6] Peg or visual tallying was selected over picture tallying because it is cheaper and less burdensome for making tallies as infrequently, and of such small amounts as required for the check and control counts.

TABLE 2. SAMPLE TALLY CALCULATION.

Scale Ticket	Delivery Ticket Tally	Gross Truck Weight-Lbs.	Tare Truck Weight-Lbs.	Net Pipe Weight-Lbs.	Min. Allowable Weight-Lbs.
#16668	1,661	66,640	26,580	40,060	38,036

G.T.W. -- 66,640
- T.T.W. -- 26,580
N.P.W. -- 40,060

40,060 lbs. Net Pipe Weight is greater than 38,036 lbs. Minimum Allowable Weight.

This is within the range which precludes any gross discrepancy between the vendor's shipping quantity and the purchaser's receiving record.

TABLE 3. SAMPLE RECORD OF WEIGHT COMPARISONS FOR STEEL PIPE —NOMINAL SIZE ¾-IN.

Wall: 0.133 in.— Weight: 1.13 lb/ft
Length: 21 ft 0 in.—Lower Limit: 1.09 lb/ft (−3.5% Tolerance)

Scale Ticket	No. of Joints	N x 21 Footage	A. P. I. Weight (Lbs)	Minimum Weight (Lbs)	Net Weight (Lbs)
*16655	1,229	25,809	29,164	28,143	29,260
*16664	1,673	35,133	39,700	38,311	39,980
*16665	1,343	28,203	31,869	30,754	31,860
*16668	1,661	34,881	39,416	38,036	40,060
*16670	1,681	35,301	39,890	38,494	40,540
*16674	1,683	35,343	39,938	38,540	40,100
*16676	1,680	35,280	39,866	38,471	39,440
*16677	1,680	35,280	39,866	38,471	40,480
*16679	1,669	35,049	39,605	38,219	39,740
*16735	1,680	35,280	39,866	38,471	39,580
*16736	1,680	35,280	39,866	38,471	39,040
*16743	840	17,640	19,933	19,236	20,000
*16817	1,680	35,280	39,866	38,471	40,600
*16823	1,680	35,280	39,866	38,471	40,220
*16824	1,260	26,460	29,900	28,853	30,500
*16926	1,260	26,460	29,900	28,853	30,020
*16985	1,680	35,280	39,866	38,471	39,720
*16986	1,680	35,280	39,866	38,471	40,460
*16988	1,680	35,280	39,866	38,471	39,960
*16992	1,680	35,280	39,866	38,471	39,340
*16997	2,100	44,100	49,833	48,089	49,600

Canadian Report

THE GAS INDUSTRY IN CANADA

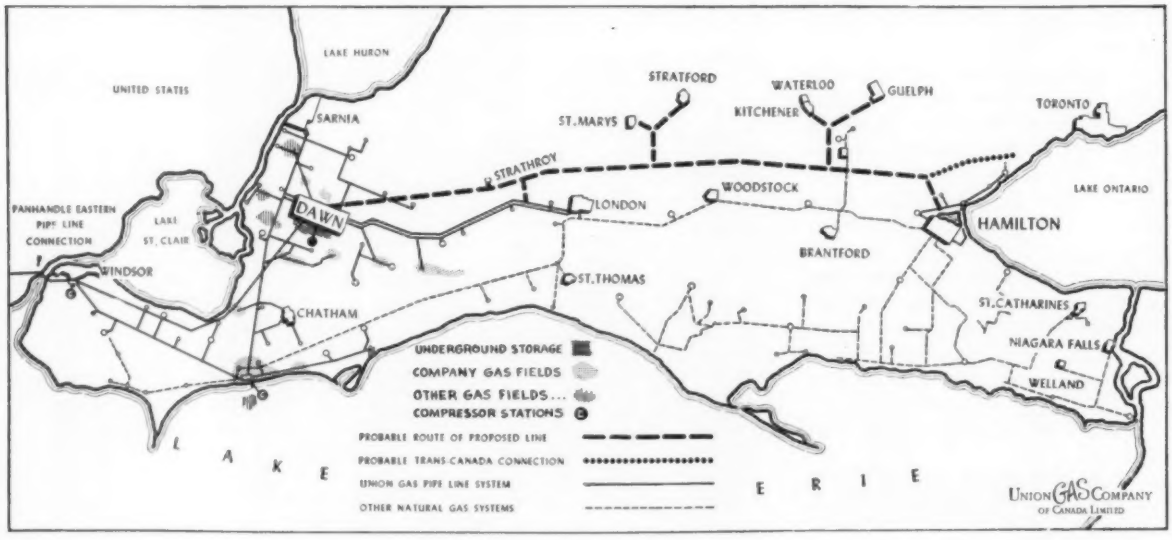
By FRANK CHAPMAN

Union Gas Co.— a completely integrated operation

THE Union Gas Co., Canada's first large scale distributor of natural gas, is looking to additional supplies of gas from western Canada by way of the proposed Trans-Canada gas pipeline to support its own ambitious plans for expansion throughout southwestern Ontario. The company, which has for many years served the rich agricultural and industrial Ontario peninsula across the Detroit river from eastern Michigan, expects to use the new supply of natural gas to replace its current purchases from the states

(*Continued on page* 100)

Diversified industrial uses of gas are an important segment of Union Gas Co.'s operations. Worker at left holds a small sherbert glass made in a gas-fired glass-molding machine. Below is a map of the Union Gas system.



A CENTURY OF SERVICE

The story of the Mueller Co. and development of its products — both dedicated to safety and service in gas and water utility work.

1857

By J. FRED EBDON, Editor

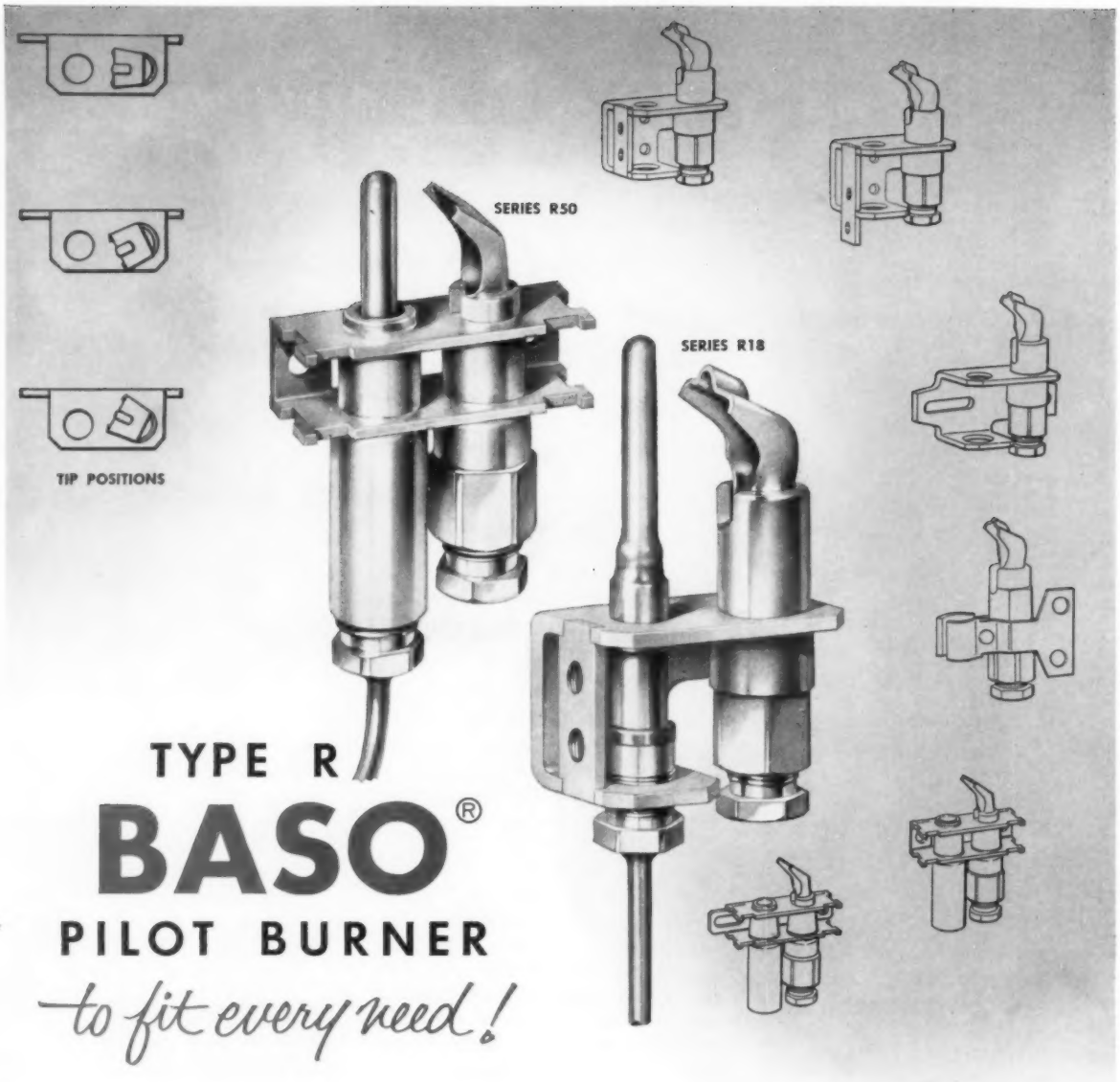
DOWN south, in Houston, a construction truck with a gas company's decal on its doors smoothly rolls through a new housing development. Soon, a welder will be using his oxy-acetylene equipment to weld a forged-steel service tee to a service line and then weld the tee to a steel main. The service line will be activated with natural gas without loss of gas to the atmosphere.

In New England, a whirling of fine-meshed, well oiled gears accompanies the metallic song sung as a 6-in. shell cutter bites into carbon-steel line pipe. Soon, a hot tap will be made against 350-psig gas pressure. An air-motor powered drilling machine is doing this job. Again, no gas escapes to the atmosphere.

Still another gas company is in action at this selected moment. Way out west, a gasman twirls a brace and the peculiar rasping of plastic material being milled is heard. In a very short time, natural gas will be flowing from a plastic main into a plastic service line via a plastic service valve-tee. No gas will be encountered in the bellhole or nearby this excavation.

Back in Decatur, Ill., the cradle of these operations hums and hammers through another busy day. Liquid metal flashes and sparks as it leaps from ladle to mold in a technically advanced foundry. In other parts of the plant, boring

1957



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BASO INC.

MILWAUKEE 1, WISCONSIN
Dept. SC-2

(Formerly Milwaukee Gas Specialty Company)

mills face away on forgings, hydraulic presses and hammers shape and batter high-strength metal pieces, an engineer draws the detail of a new idea into a design, and skilled assemblers make a mechanism out of mere parts.

Work being done at the several points of interest has the same basic concept — *safety* for men, equipment and property during gas industry operations. An amalgamation of gas companies and products from a pioneer manufacturer permits these gas operations to be accomplished under conditions of maximum safety. To both, this means holding gas where it belongs, in the conduits and appliances designed specifically to assure good gas service.

The manufacturer specifically involved—and it is the first to point out that it has no exclusive claim to the promotion of safety in the gas industry—is the Mueller Co., headquartered in Decatur. Mueller salutes the entire gas industry in 1957 as this year marks the 100th anniversary of its cooperation with, and service through products to, the gas industry.

The "story" of the Mueller Co. is the evolution of an American business organization. It is not just the story of a manufacturer of products for the gas industry. Mueller's 100 years on the American business scene has been very closely allied with both the water and gas utility industries. As Albert G. Webber Jr., president of company put it, "In celebrating our 100th anniversary, we wish to remember and pay tribute to all who have contributed to the tremendous improvement of services and to the vital progress of the water and gas industries."

A company is born

The origin of the Mueller Co. was in a very unsophisticated repair shop at Decatur in 1857. Locks, keys, firearms, and bicycles were made and repaired. There, Hieronymus Mueller delved into several fields, all relating to applied mechanics. The repair shop evolved into a gun shop. Fowling pieces of excellent quality were produced and marketed on a limited basis, characteristic of the era.

Later, the founding Mueller was made City Plumber of the City of Decatur. He launched a personal program to develop mechanical products for the utility industry that would make operations more efficient and the life of the utility employee a bit more comfortable and safe. These factors were not high on the list of considerations probed by the utilities of that day.

An interesting sidelight to the career of H. Mueller was his fascination with automobiles. A Benz machine (horseless carriage) was imported from Germany in 1890. Mueller experimented with its mechanisms and systems. He filed and received several patents in the automotive field. An electric ignition system was developed and the first sliding gear transmission was credited to this skilled mechanic. Three or four automobiles were produced and raced under the Mueller name before the untimely death of the founder.

The water service utility business attracted most of the attention of the young company. A tapping machine for use when making service connections to water mains without allowing the flow of water in the trench or bellhole was developed. Many other devices were made for this growing market. The company produced many varied items, particularly brass goods, for the utility and plumbing industries. Naturally, some of these found their way into the then fledgling gas industry.

For a number of years, the attention and production of the company was centered on the particular needs of the Decatur locality. By 1894, however, the basic line of goods, for utility industries, was well established across the nation. But the emphasis was still on the water utility industry.

Some of the early items are still made; others have fallen to the strides of progress. One can still see wiped-solder joints make on gooseneck water service connections in the Mueller plant. This is one of the earliest products still being fabricated and used. Stopcocks for service connections to wooden water (and early gas) mains are still available. But, the Mueller Co. currently markets a full line of modern equipment for the gas and water industries.

Products of progress

All of the gas service between 1816 and, say, 1920 in the United States fell in the general classification of low pressure. When "high pressure" natural gas began to be transported and distributed at pounds pressure, work started on the development of machines and fittings to handle this energy fuel safely. The gas industry was generally respectful of the difficulties encountered with handling gas at the then high pressures. Mueller was ready for the "high pressure" gas years with machines and fittings developed from its experience with the water industry, as well as with the growth stages in the gas industry.

The West Coast was the first gas service area to operate at more than a pound or two of gas pressure. Common practice around 1917 was to use a simple machine (crow hook or "old crow") to drill and tap cast iron mains. Then, the workman would put his foot over the tapped hole to more or less shut off the blowing gas. A street tee would be screwed into the tap. A service tee and street elbow would be used to complete the connection with the service line. This made a swing joint that was essential during the manufactured gas days with the attendant condensate drip problem. Often, some type of locally produced or shop produced rubber plug was used to stop the gas at the service tap in the main while the swing joint and service line connection were made. Then, gas was allowed to blow while the service line was put into operation.

Engineering personnel in the Mueller Co. studied the problem of making service connections as early as 1907. The Mueller catalog for 1907 was a masterpiece of the art. An excellent, heavy paper stock was used and engraving, embossing and fine color work abounded. It was big, thick and done on a lavish scale. Oldtimers still chuckle when they recall that the company nearly got into financial difficulty when time came to pay for the publication.

In the 1907 catalog were the attempts that lead eventually to No-Blo products. There was a set using a service clamp with a street

In the 1800's, corporation stops were often driven into the main.

Around 1917, main was tapped by machine and the tap plugged with a shoe.

Now fittings and equipment permit service connections without loss of gas to the atmosphere.

tee in the clamp outlet. A street elbow was screwed into the horizontal outlet of the tee. For "high pressure" service connections a set with a gas main cock installed between the service clamp and the street tee was offered. Thinking at this time in the Mueller Co. was in terms of doing connection work with maximum safety.

By 1915, a tee had been designed in the Mueller product development laboratories that was basically equivalent to the current Mueller No-Blo tee. However, there was little market for the fitting in those days, so it never reached full production. Their engineering division exhibits samples of these fittings for historical value.

From this point, more engineering research was applied to the premise of perfecting tapping machines, fittings, and other necessary equipment to enable service connections to be made without permitting gas to blow during any phase of the operations.

The key was found with the perfecting of a basic idea—the use of both internal and external threads on the top outlet of the tee. This permits operations to be completed through the valve and tee against pressure, with a double seal provided to prevent gas leakage.

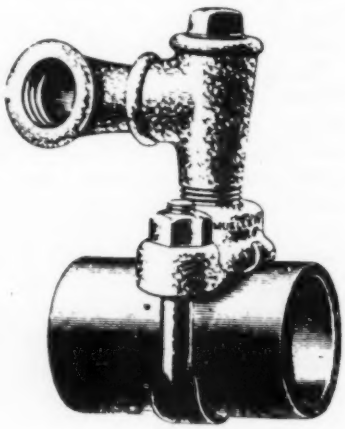
A patent application for the Mueller No-Blo tee, and other operating devices to facilitate its task, was filed in the name of Frank H. Mueller—grandson of Hieronymus Mueller—on Jan. 12, 1933. The United States Patent Office granted the patent on April 2, 1935.

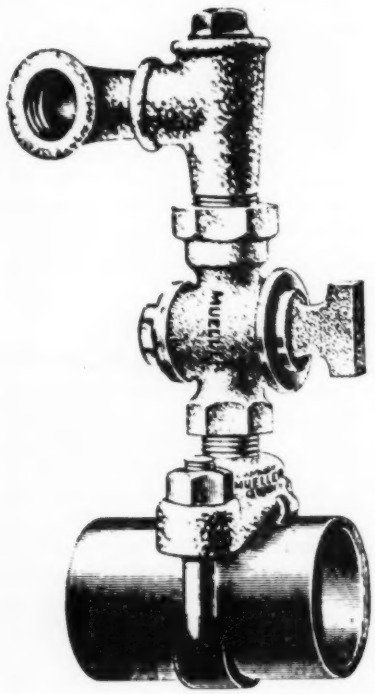
Many improvements in design and metallurgy have been made since the patent was granted. But, the fundamental principle remains unchanged. A variety of products have evolved from the basic No-Blo service tee to fit the needs of the gas industry. Valve tees and curb valve tees have been made available. Required inlet and outlet combinations and types are currently produced. And the factory makes parts for the products.

Drilling and tapping devices

The Mueller drilling and drilling-and-tapping machines sprung from the 1870's when the customary method for making service connections to water distribution mains was to chisel out a pilot

Service connection "sets" shown in Mueller Co.'s 1907 catalog indicate No-Blo thinking is not new. System shown below was for ounces operating pressure. "High pressure" set is shown at right.





gouge, then drive a corporation stop into the main with a sledge. It was not unlikely that the sledge missed the cock and broke the main. The plumber was then working against a stream of water while in water. City Plumber Mueller started working on machines and fittings to do this work in a more efficient, comfortable manner.

Gas distribution companies had tried several types of drilling and/or tapping machines prior to the turn of the century. They borrowed a Crow Hook or Old Crow device from the water utilities. With it, they could drill through combinations of fittings and stopcocks to make more or less gas tight connection operations but more often they let gas blow.

The Mueller Co. brought out a refinement to the Old Crow. Their B-110 "Our Special" dry pipe and gas main tapping machine, listed in the remarkable catalog of 1907, considerably improved the Old Crow and completed its evolution to the gas industry. But, the "Our Special" was still a rather basic device.

Soon, Mueller machines were on the market that enabled gas companies to drill through the low pressure and "high pressure" service connections sets that marked the first attempt at real No-Blo construction. Some of the early machines drilled and tapped.

The pioneer Mueller machines changed the concept for making service connections to operating mains in the water and gas utility industries. Basic principles of the early equipment were sound. Units were soon being used to effectively control many fluids when making service or other taps, main extensions, etc.

Some of the basic machines, with improvements, are still made and used. From them, the tree of evolution branches to the modern complete lines of drilling and drilling-tapping machines. This engineering evolution was a major contribution to the current No-Blo equipment line used by many gas companies for construction work in wide ranges of sizes and applications.

Larger drilling machines

At the same time that development work was being done in the field of the small drilling and drilling-tapping machines, Mueller engineers were investigating machines for doing similar work in larger sizes. Following the marketing phase of the B-110 "Our Special," Mueller purchased manufacturing rights to the Eley pipe pressure drilling machine. This unit was produced for a few years and was then superseded by the D-2005 large drilling machine.

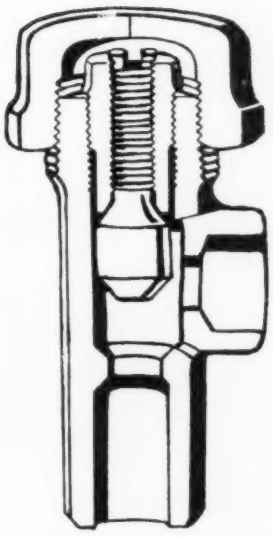
The D-2005 was designed for making connections on water mains (and was used on gas) from 4- to 48-in. diameter. A No. 1 unit made cuts of 2, 3, 4, 6 and 8 in. The next unit, No. 2, took the series through 12-in. cuts. And, No. 4 unit made 30-, 36-, 42- and 48-in. cuts. The No. 4 unit machine was powered by a gasoline engine.

Next on the scene was the Mueller Drilling Machine No. "C". This early model was a two-bar machine. It was hand operated, but made use of a gear drive. Bevel gears were used in this unit that was the first to take the general appearance of current Mueller machines.

Another early "C" machine in the series was brought out about 1920. It had the proven bevel gear drive. The body was an open, four-bar type. The range of the unit was drilling for branch connections from 2 to 8 in., inclusive, on pipe from 4 to 48 in. The specialized Mueller tapping sleeves and valves were developed about the same time.

The familiar "C-C" hand-operated and "C-1" powered drilling machines then came on the scene. These units have been operated in the gas industry for years to make cuts from 2 to 12 in. in pipe of any size. Their use has carried over into nearly every industry that handles fluid in conduits.

Special equipment has been produced to augment the adaptability of the large drilling machines. Just about any type of cut for main extensions or laterals and large service connections to mains can be made with the proper combination of fittings and/or adapters. Mains can be drilled through tapping valves, gate valves, tees, nipples, and Mueller line stopper fittings.



Valve or "pin-off" tee. One of the products from evolution of the basic No-Blo service tee.

The "C-1" machines can be powered by either air-motors or gasoline engine drive units. A worm gear drive is used for the power drilling machine; bevel gear drive is retained in the hand-operated machine.

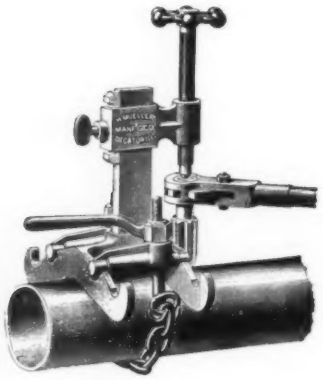
Both units are rated to operate on gas lines carrying up to 500 psig pressure. To complement the "C" series, an "N" machine was made available to drill openings from 1.5 to 3.5 in. in the 500-psig class.

Line stopper units

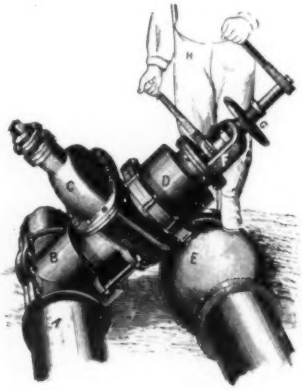
In the late twenties and early thirties investigation by Mueller engineers convinced the company that there would be a growing need for some method that would allow stop-off of gas mains and pipelines at points where work must be done and at which there were no installed valves. The advent of natural gas sparked the need for this method. Operating pressures were going up in all phases of the gas industry as the spread of natural gas service quickened.

A. P. Smith Co. machines were making hot-taps by 1899; possibly there were several other companies and individuals who had made progress toward this objective prior to the Mueller Co.'s development program. Harry E. Wolf had been applying his talents to the problem, under a working agree-

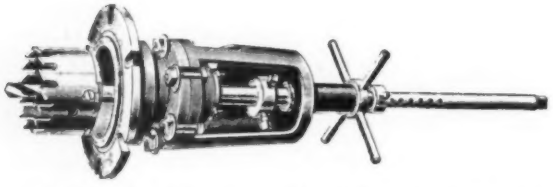
EVOLUTION OF THE DRILLING MACHINE



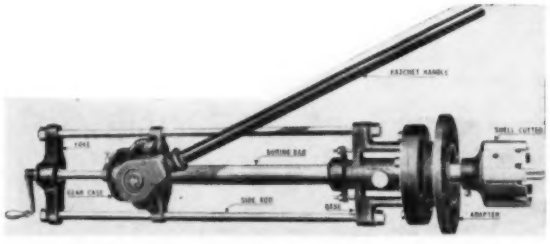
A refinement of the "old crow" put on the market in 1907.



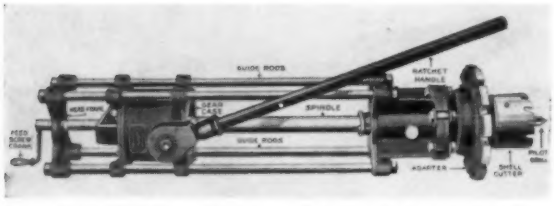
Eley drilling machine, proven in water utility industry.



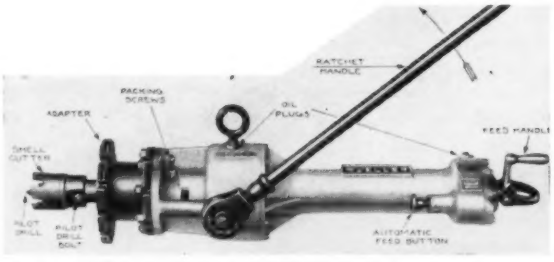
A real pioneer, the D-2005 series machine that made cuts from 4- to 48-in. diameter.



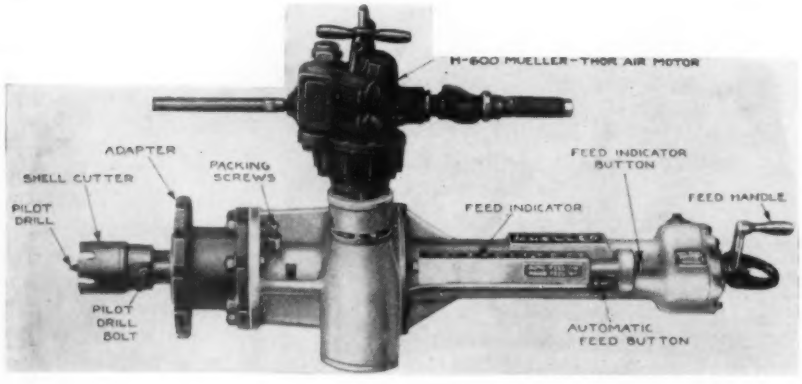
First of the "C" series, the two-bar machine pioneered the gear drive.



An early "C" series, four-bar, gear-driven unit for gas and water work.



Modern "C-C" hand-operated drilling machine.



Modern "C-1" power-operated drilling machine.

ment with Mueller, since the mid-twenties. He invented a stopping machine that was patented in 1931.

The Wolf machine cut a coupon as large as the pipe from the engaged half of the pipe. An expanding rubber stopper fitted inside the cut and pipe to give the stop-off. The machine had its troubles, but so far as can be determined, it was the first stopping machine ever developed.

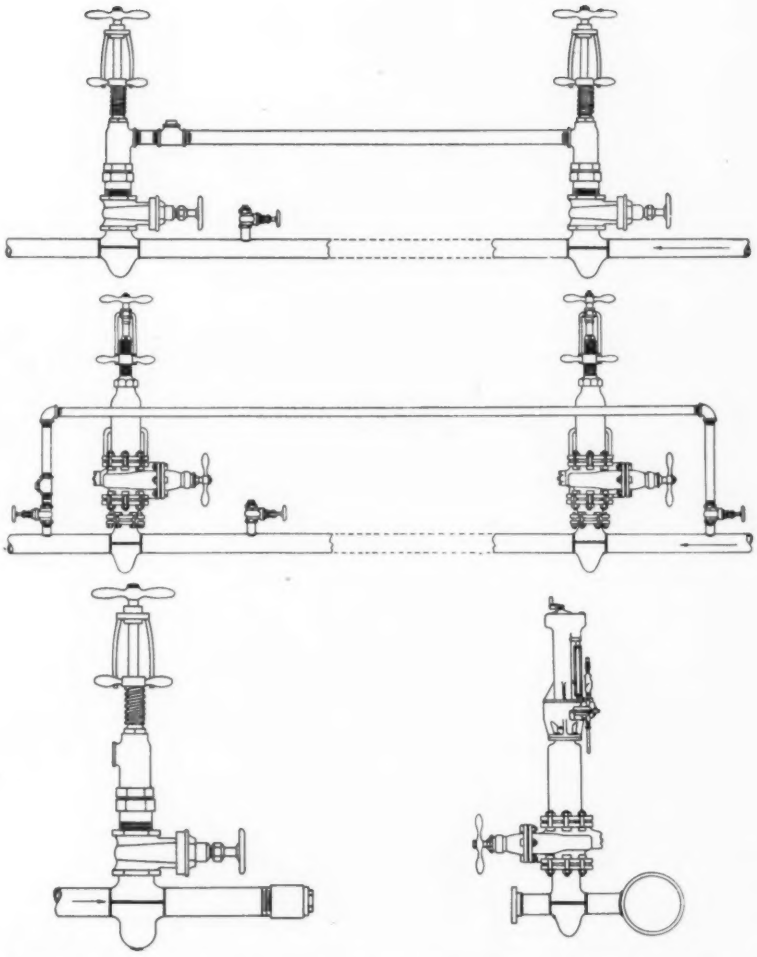
Mueller Co. purchased Wolf's patents and applied its engineering know-how to the task of ironing out some of the problems. The major problem was the metal trash (chips, burrs, etc.) that was deposited in the pipe or blown down it during the drilling operation. Magnets, among other ideas, were used with varying success. It was designed for use on only the smaller sizes of pipe, so this limited its evaluation as a complete success. However, this unit is given full credit by Mueller Co. as being the first in its type for what we now know as the Mueller No-Blo line.

Another stopping machine was patented by Uhel U. Carr and Major R. McKinley in 1932. The Carr-McKinley device had a stopping mechanism that was inserted through a hole in one side of the pipe for internal expansion. Mueller engineers experimented with this machine for some time and made several of the units for field use; however, several problems were never worked out.

Later, Timothy A. Larry, an employee of Southern California Gas Co., made a stopping device that drilled a hole slightly larger than the inside diameter of the pipe, and completely through the pipe. His stopper was an expandable rubber plug that was actuated in the pipe. This system overcame the objections of irregularities, chips, and mechanical strength often associated with the previous ideas.

Mueller and Larry worked out an agreement for the former to develop the idea into a commercial product. The stopping equipment was placed on the market in 1935.

Many improvements and modifications were patented under the names of Mr. Larry and Earl E. Cline, a Mueller Co. engineer, to extend the range of the equipment to work on larger sizes and higher pressures. Between the idea phase and the present time, many engineering, production, and operating problems were solved under the direction of the Mueller Co. with cooperation from many individuals and gas companies.



Typical line stopper unit applications. Top two drawings show repair or replacement of an existing main. Below left: making a main extension. Right: making lateral connections.

Basic elements of line stopper equipment are line stopper fittings, gate valves, a drilling machine, stopping machines, and a completion machine, along with tools and fittings that will allow flexibility over the desired range of sizes and piping system design. Development of this modern, commercial equipment followed a similar pattern of engineering evolution in industry.

The practical applications for line stopper equipment in the gas industry are too numerous to detail. Classical applications are for shutting off gas flow upstream and downstream from a section of main to be replaced. Normal gas flow is by-passed through temporary piping (the Mueller equipment is brought into play here in the initial stages of the project) or through a by-passing arrangement integral with the machines. No gas blows to atmosphere during these operations.

Side connections for laterals from mains or for large service connections are an often-used application. Through suitable nipples and valves, the drilling machine drills from a horizontal position and the line stopper is expanded in a line-stopper fitting by a stopping machine in a vertical position,

Traveling unit that toured the country. All equipment and display for complete instruction in safe gas construction practices was carried.

after the cut is made. The lateral or service line is connected; then, the line stopper plug is removed to place the connected piping in service.

The latest device for stopping gas lines is the steel-wedge stopper. This is essentially a steel split-sleeve, with a flexible covering over both sleeve sections. Opposed internal wedges draw together causing riding inclined planes to force the split-sleeves apart. The sleeves seat on the pipe walls left after shell cutters drill completely through the pipe.

The idea for this stopping principle originated with Edgar A. Koenig, of Magnolia Pipe Line Co., and was developed by the Mueller Co. The steel-wedge stopper is produced in sizes up to 12 in. Maximum working pressure is 500 psig. Work has been done, and is being continued by Mueller engineers to extend stopping devices to larger diameters of pipe and higher working pressures.

Service through training

In the mid-1930's, Mueller Co. became aware of the need to extend training as a service to gas companies that wanted to use No-Blo equipment. Prior to this time, area representatives were used to maintain product-use training liaison between the gas companies and Mueller Co. As a group, they did not have the time or capabilities for instructing.

A program for bringing gas industry men to Mueller's Decatur plant for instruction and demonstrations was started. Full demonstration facilities were set up in an engineering conference room or "No-Blo" hall, as it was popularly known. The gas company people were housed at Mueller Lodge, located on a beautiful nearby lake.

From the beginning, this program was "booked solid." Tuesdays and Thursdays of each week were scheduled for No-Blo training conferences. For a Tuesday group, for instance, the gas company personnel would arrive in Decatur on Monday afternoon and go directly to the Lodge for dinner, greetings from the company, maps of the city showing plant locations, refreshments, etc. An informal "get-together" was the program during the remainder of the evening.

The next morning, following breakfast at the Lodge, the "class" met at 8:30 in the No-Blo room. Instruction and demonstration covered stopping-off and by-passing pressure mains; tieing-in laterals under pressure while using the old main for by-passing; making service connections with welding fittings and threaded fittings to various types of mains; making up welded, threaded, mechanical joint, and combination services; and many other phases of distribution work. A short break for coffee was held at mid-morning. Lunch was served in the Mueller cafeteria and the group was soon back in the classroom for further interchange on modern gas construction methods. Technical representatives from the Mueller staff were on hand to help with individual problems.

The more formal part of the sessions was wound up about 4 p. m. Then, a very informal question-and-answer hour was held. The gas company group returned to the Mueller Lodge for dinner, recreation and fellowship. After spending the night, they were served breakfast and then departed for their hometowns.

These training classes became famous and served a growing need of the gas industry. Classes were reserved by individual gas companies for some time in advance. The waiting list seemed to increase as the program carried over into years. A decision was made in the Mueller Co. to put the No-Blo demonstration "on the road," to take the technical discussions to gas company people, rather than bring the people to Decatur. In this way, many more gas company people could receive the instruction.

In 1952, the Mueller No-Blo Caravan—a station wagon with a four-wheel trailer — started on a trip that was to last for 11 months. It visited city after city. At each, the local gas company provided a con-

ference room of one sort or another. A complete demonstration was provided by the two Mueller technicians who made the "circuit." This was not in any way a sales project. It was a program designed to acquaint and instruct interested gas company personnel with the latest techniques for utilizing No-Blo products in gas utility construction work.

The initial trip of the caravan took it to nearly every section of the United States. It has, since that start, hit every part of the country. Mueller Co. found that after gas company superintendents saw the "show" and realized it was more instruction than demonstration, with no sales pitches, they usually wanted all of their crews to see it. The traveling unit is still available to any and all in the gas industry.

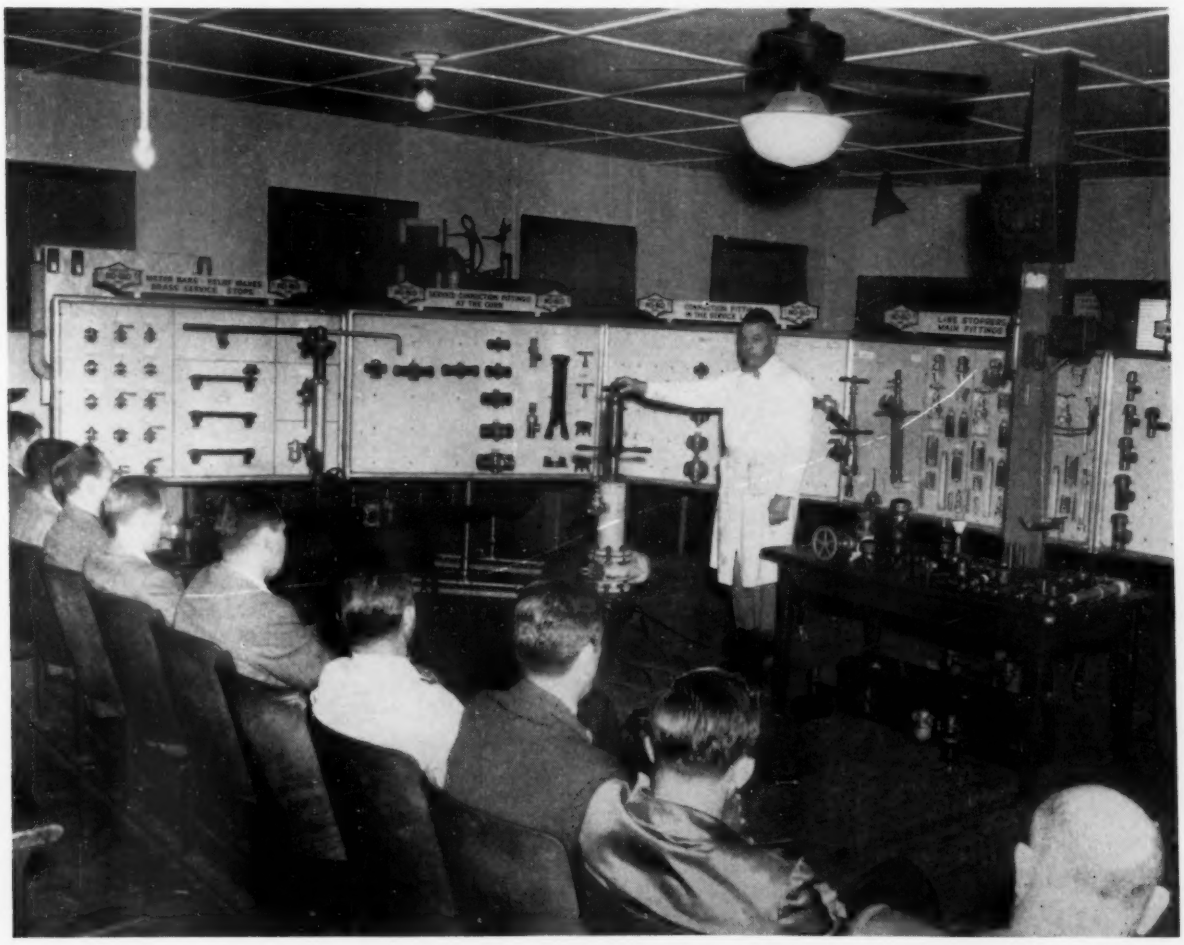
The gas companies have given service to their customers. This service extends far beyond basic gas service. It ranges from the construction of a loop in a pipeline to showing housewives how to efficiently use gas-fired appliances. American industry is characterized by its eagerness to provide service in addition to that associated directly with supplying a basic service, facility, or product. In this vein Mueller will continue training and "consulting" service to gas companies who use or want to investigate the use of No-Blo equipment.

The second century

From the small repair shop in Decatur, the Mueller Co. has grown to modern factories in Decatur, Chattanooga, Los Angeles, and Sarnia, Ontario, Canada. The time-tested Mueller products continue to be made while new products are developed, tested and put into production. All are founded, machined and assembled under rigid control necessary to maintain Mueller quality standard.

The Mueller Co.'s evolution has paralleled that for the gas industry. The company is proud of its evolution, but it finds more pride in the growth of the gas industry and the service it has rendered to it by contributing to the development of safe gas construction techniques.

Mueller management knows that the gas industry will carry on its growth by rendering dependable, safe gas service to the consuming public. Mueller's production facilities are geared to keep pace with this gas industry attitude by turning out long-lived, dependable products that are designed to stress safety while providing the implements for gas industry growth. ■

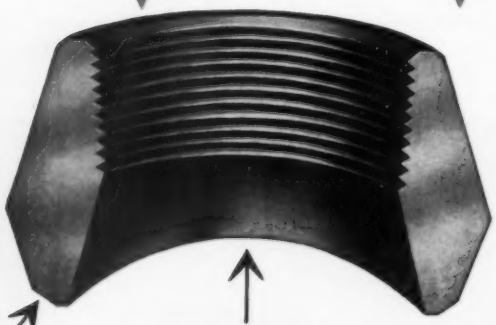


When the traveling unit stopped, local gas company technicians were given a one-day "course" of instruction in practical applications of No-Blo equipment.

HOUSE CONNECTIONS
on NEW steel distribution mains

NEW GAS COMMUNITIES

STEEL REPLACEMENT OF CAST IRON MAINS



RUGGED
FOR PERMANENCE AGAINST EXTERNAL FORCES AND CORROSION

FAST
INSTALLATION IN THE STREETS WHERE MINUTES COUNT

SHAPED TO FIT
BEVELED FOR WELDING
SPECIFY AND USE

BONNEY THREDOLETS

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GAS abstracts

HEAT APPLICATIONS TO GAS-FIRED, PORTABLE DECK BAKE OVENS — AGA Laboratories Research Bulletin 73.

Means are developed for improving the performance of conventional gas-fired portable deck bake ovens of both the direct-fired and muffle types, or of combinations of these two types.

Heat application studies involved oven performance evaluation with the following alterations from conventional design: (1) increased turbulence of hot gases in the baking compartments of direct-fired ovens, (2) reduction in excess combustion air in direct-fired, muffle type, and top and bottom heat ovens.

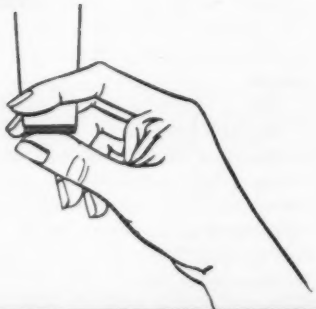
Using a small fan for increased turbulence of hot gases in baking compartments of direct-fired ovens, yellow cake batter was baked satisfactorily in less than half the time (14 minutes) normally required (30 minutes) because of the substantial increase in convective heat transfer to the cakes, and the acceleration of water vapor removal from the cakes. Furthermore, uniform heat distribution was assured over the entire baking deck except for a small localized area in the immediate vicinity of the fan. Cakes baked with the fan operating were fully acceptable in terms of texture, doneness and surface browning, except that surface color in the immediate vicinity of the fan was either too light or too dark over about 5-10 per cent of the cake top surface area. It appears that even this small area could be improved with refinements in adapting a suitable fan.

With the limits of satisfactory combustion, reductions in excess combustion air flow through all types of contemporary ovens studied resulting in substantial reductions in heat consumption during baking and maintaining periods. Furthermore, such reductions had no adverse effects on oven heating-up times nor on heat distribution necessary for producing uniformly baked cakes and pies.

This PAR Plan research investigation, designated as Project IA-2, "Development of Factors Leading to More Effective Application of Heat to Deck Bake Ovens," was sponsored at the American Gas Association Laboratories by the association's committee on industrial and commercial gas research.

COMBINATION REGULATOR *with* SAFE LIGHTING FEATURE

PUSH BUTTON



First again in gas control development, Thermac offers appliance manufacturers the most outstanding advancement in gas pressure regulators and safety control devices on the market today. The new "SL" Series shown is identical to the widely accepted Thermac "SR" Combination Regulator and Thermo-Electric Pilot, except that a safe lighting feature operated by a red push button has been added.

Appliance Manufacturers are invited to request samples of this new Thermac "SL" Series with the safe lighting feature. The simplicity of this control is extremely important, particularly to the customer in the field. Easy to use, easy to understand — no mystifying gadgets to complicate usage. Like all Thermac controls, the "SL" is positive in action — rugged and fool-proof in construction.

Write today for capacities, prices and SAMPLES of the "SL" Series. Available now in ½" and ¾" sizes. Let us demonstrate to you Thermac's superiority of product and service.

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SIZES AVAILABLE TO HANDLE APPLIANCES UP THROUGH 250,000 BTU/HR.

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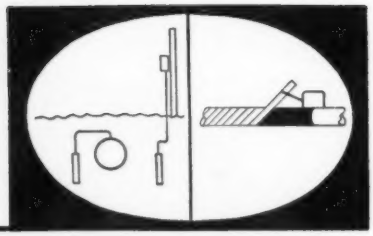
Corrosion Prevention

DISTRIBUTION • TRANSMISSION



Offshore pipelines are of increasing interest to corrosion engineers with operations along the Texas, Louisiana, and California coasts. Most of these lines are buried to combat corrosion, and to prevent growth of marine life. Also, government regulations require burial in water less than 15 ft deep and other good reasons are involved.

For the coatings, weight, resistance to barnacles, and corrosion resistance are of basic importance. The most-used coating system to date is from 1 to 3½ in. of heavy-aggregate concrete over a conventional pipeline enamel or asphalt mastic system. Biggest problem here, cracking the concrete during transporting and handling.

A new asphalt-mastic, barite weighted coating can be applied on the lay barge during actual construction operations. This system is expected to eliminate most of the cracking problems and there is no need for field-joint coating.

With conventional concrete coatings, joints have been treated and wrapped with enamels, felt, and paper; then, concrete is added by pouring a quick-setting material into a cardboard form held in place with steel banding. Some companies have used plastic tapes at field joints.

Work is being carried forward on coating techniques for underwater valves in offshore natural gas pipelines. Such valves are few, but they must be installed when a tie-in is made to an offshore line. Irregular surfaces make these devices tough to continuously coat. Several companies have used sacrificial anodes to provide local cathodic protection at underwater valve sites.

* * * * *

Painting aboveground metallic structures does two major jobs in the gas industry. First, it can be used to provide a more pleasing appearance, and, second, it should prevent corrosion.

More gas companies are using paints to make their structures attractive than ever before. Distribution companies, particularly, are turning to pastel colors to help blend town border, district regulator and metering stations with surroundings. Some do this even when there are no residential developments near the installations. They know that homes may be built near their stations in the future.

Pipeline companies have also started using colors. Aboveground piping at compressor stations, plants, etc., have been so treated.

But, perhaps more important is the corrosion prevention value of paints. Painted systems thwart flow of electrolytic current and seal metal surfaces against moisture and oxygen. Its purpose is to prevent the formation of any kind of corrosive environment.

Paint is a very broad term. It includes many materials and complex chemistry. Corrosion engineers have a hard time evaluating performance of paint coatings. Then, repainting frequency enters the engineering evaluation, as does the corrosive climate of particular jobs.

Recent studies show that labor accounts for at least 80 per cent of total painting costs. This deemphasizes the cost of paint material and stresses surface preparation and application method.

Many gas companies are specifying use of long nap rollers for applying paint to flat, gently curved, and other surfaces. This method produces a more uniform coating than can be expected from hand brush or spray painted work. The technique of the workman is too large a factor in the latter two methods. However, each has its area for advantageous application.

* * * * *

The question: use of rectifiers or anodes for cathodically protecting a pipeline was discussed in a paper by W. E. Huddleston, given during an NACE—University of Oklahoma corrosion-control short course last year. His conclusion, the present and future condition of the right-of-way is fundamental in answering this consideration.

The fire and explosion hazard—negligible when using sacrificial anodes—should be considered for rectifier installations. Sparking can be experienced when rectifier circuits are made and broken. The danger therefrom is directly related to location and/or right-of-way condition.

The presence of foreign metallic structures is another factor. Properties of others can be materially damaged by cathodic interference. Mutual interference can also produce a problem to both or all companies involved.

Right-of-way might be invaded with stray d-c current. A survey, therefore, should show suitability of either rectifiers or anodes rather positively in stray-current areas.

Then, communications systems—particularly open-wire circuits—may be recipients of interference from corrosion-control systems. Filters placed in rectifier circuits make the problem of carry-over harmonics soluble; however, the factor should be considered in the over-all decision.

Property owner relationships, farming activities in or near the right-of-way, easement, etc., join with the more obvious, such as physical obstacles and the future changes in right-of-way condition, in the selection: anodes vs. rectifiers. ■

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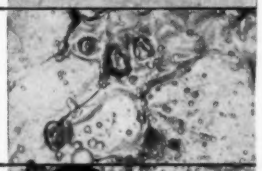
BRAND	Unretouched Microphotographs of Test
A.O.Smith Permaglas® NO METAL EXPOSED TO CORROSION	
BRAND A Moderately Eroded METAL EXPOSED	
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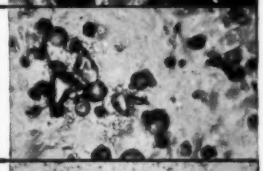
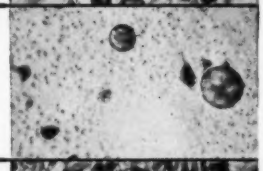
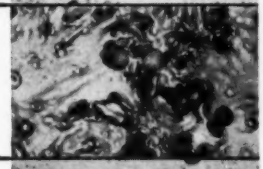
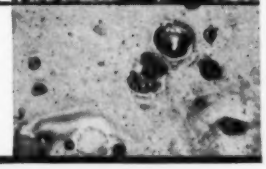
BRAND C Badly Eroded METAL EXPOSED	
BRAND D Moderately Eroded METAL EXPOSED	
BRAND E Badly Eroded METAL EXPOSED	
BRAND F Moderately Eroded METAL EXPOSED	

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Now, for the first time, you actually *know* that there's a big difference in glass-lined water heaters—and that *Permaglas* lasts 55% longer than the average of all brands tested. You can PROVE that difference to your customers, and sell them *Permaglas* more easily than ever before.

And Here's a BIG NEW Campaign To Help You Cash in—NOW!

NATIONAL ADVERTISING—Full pages in color in nine leading magazines will tell this outstanding story to millions—to your customers.

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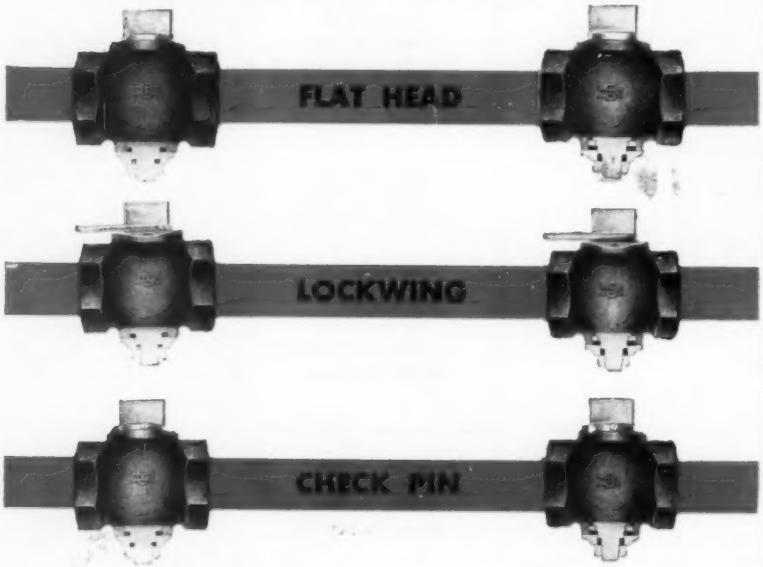
Iron Body with Brass Plug . . . Black or Galvanized



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for Easy Handling . . .
Space Saving Storage

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GAS SERVICE PRODUCTS

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GAS calendar

April

8-10. . National Conference of Electric and Gas Utility Accountants—Sheraton-Park Hotel, Washington, D. C.

8-10. . GAMA Annual Meeting — The Greenbrier, White Sulphur Springs, W. Va.

8-11. . AGA Distribution, Motor Vehicles and Corrosion Conference —Rice Hotel, Houston.

12. . Southeastern Gas Association Round Table Sales Conference—Selwyn Hotel, Charlotte, N. C.

12. . Maryland Utilities Association Annual Spring Business Conference—Lord Baltimore Hotel, Baltimore.

16-18. . Petroleum Industry Electrical Association & Petroleum Electric Supply Association 29th Annual Convention & Exhibit—Shamrock-Hilton Hotel, Houston.

16-18. . Southwestern Gas Measurement Short Course—College of Engineering, University of Oklahoma, Norman.

16-18. . AGA Sales Conference on Industrial and Commercial Gas—Jung Hotel, New Orleans.

24-25. . PCGA Accounting Section Spring Conference — LaPlaza Hotel, Carmel, Calif.

24-26. . Natural Gasoline Association of America 36th Annual Convention Rice Hotel, Houston.

25-26. . Indiana Gas Association—French Lick-Sheraton, French Lick, Ind.

29-May 1. . Southern Gas Association Annual Convention — New Orleans.

May

Natural Gas & Petroleum Association of Canada—Hotel London, London, Ont., Canada.

2- 3. . PCGA Distribution Conference—El Mirador Hotel, Palm Springs, Calif.

6- 7. . AGA Residential Gas Section Eastern Sales Conference—Hotel William Penn, Pittsburgh.

7- 9. . AGA Research & Utilization Conference—Cleveland, Ohio

8-10. . Joint AGA-PCGA Gas Supply, Transmission & Storage Conference—Mark-Hopkins Hotel, San Francisco.

10. . Southeastern Gas Association Emergency Procedure Conference —Selwyn Hotel, Charlotte, N. C.

14-17. . Institution of Gas Engineers—London, England.

19-22. . TIPRO Convention — Galvez & Bucaneer Hotels, Galveston, Texas.

20-22. . AGA Mid-West Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.

20-22..AGA Chemical, Engineering and Manufactured Gas Production Conference — Balmoral Hotel, Miami Beach, Fla.

20-23..29th Annual Exhibit of the Oil & Gas Power Division of ASME—Kentucky Hotel, Louisville.

21-23..Pennsylvania Gas Association Annual Meeting—Pocono Manor Inn, Pocono Manor, Pa.

22-23..PCGA Home Service Workshop—Georgia Hotel, Vancouver, B. C.

28-29..PCGA-AGA Regional Public Relations Workshop — Salt Lake City, Utah.

29-31..12th Annual Short Course in Gas Technology—Texas College of Arts & Industries, Kingsville, Texas.

June

4- 6..Second Annual Appalachian Underground Corrosion Short Course—West Virginia University, Morgantown.

24-27..Canadian Gas Association—Jasper Park Lodge, Jasper, Alberta, Canada.

24-25..Michigan Gas Association — Grand Hotel, Mackinac Island, Mich.

September

3- 5..Pacific Coast Gas Association Annual Convention—San Francisco.

6..New Jersey Gas Association Annual Meeting—Spring Lake, N. J.

9-10..INGAA Annual Meeting—Shamrock Hilton Hotel, Houston, Texas.

9-13..AGA Industrial Gas School—Hotel William Penn, Pittsburgh.

11-13..Mid West Gas Association Gas School and Conference—Iowa State College, Ames.

13-14..Maryland Utilities Association 33rd Annual Fall Conference—Cavalier Hotel, Virginia Beach, Va.

16-18..AGA 9th Annual Accident Prevention Conference — St. Louis, Mo.

18-20..Southeastern Gas Association Convention—Robert E. Lee Hotel, Winston Salem, N. C.

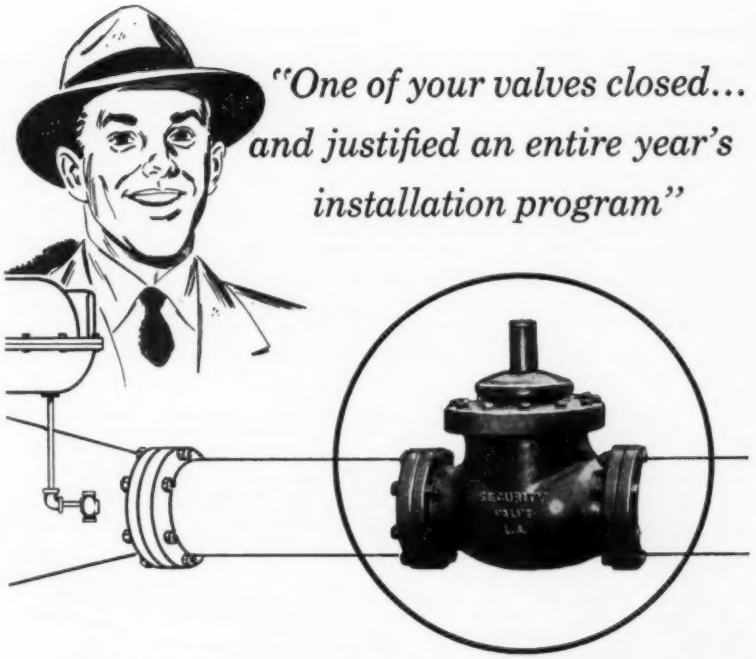
October

1- 2..Texas Mid-Continent Oil & Gas Association 38th Annual Meeting—Texas Hotel, Fort Worth.

7- 9..AGA Annual Convention—Kiel Auditorium, St. Louis, Mo.

10-11..California Natural Gasoline Association Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena.

11-14..American Petroleum Institute—Conrad Hilton Hotel, Chicago.

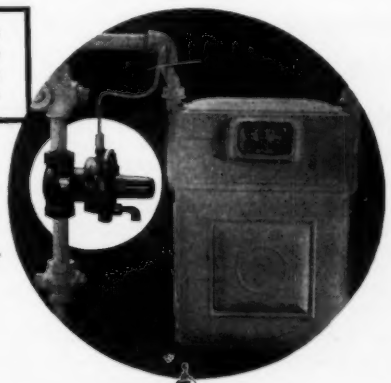


■ That's the experience of just one of the major gas companies and gas-using industries from coast to coast who have standardized on Security Automatic Shut-Off Valves. Because of their *absolute* protection against overpressuring, the operation of a single Security Valve can pay for a system-wide installation.

Security Valves are positive and always dependable . . . they are engineered for one specific function. Vital in congested areas, they eliminate both the expense and hazard created by high-capacity vent lines necessary when other over-pressure protection devices are employed.

A *complete* line, Security Automatic Shut-Off Valves are available in sizes ¾" to 12" for use on lines operating on inches water column to 1500 psig. They can be installed up or downstream of the regulator and controlled directly or by means of a pilot line.

Security Automatic Shut-Off Valves range from ¾" for domestic lines (right) to large distribution line sizes (above).



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Regulatory trends

Continued from page 12

eral court had wished to bar such activities by the applicant even though subjected to regulation, it would have made such provision and the question would not be before this commission. So far as the effect of the Consent Decree is concerned, it is not actually pertinent to the issues in this case. If the proposed service would be utility service in the absence of that decree, it is still utility service. If we held this service to be utility in nature in the gas company cases before the Consent Decree, there is nothing in the Consent Decree to prompt us to change our holding. If our previous holding that this service is utility in nature, distasteful to Pacific at the time it was made, now turns out because of the Consent Decree to be beneficial to the applicant, that in no wise affects the validity of our previous holding.

"It is to be noted that, with the exception of the City of Los Angeles, all protestants were or represented other operators in the private mobile radio telephone field. Their own convenience would be served by the elimination of a competitor.

"The members of the using public who appeared or contacted the commission by correspondence, including both present and prospective patrons of applicant's private mobile service, were unanimously and vigorously of the opinion that applicant's service in this field is excellent, reasonably priced, and needed. No one else has offered the service to all comers on equal terms and some of the witnesses testified they could not get satisfactory service except from applicant. From the mere fact that no other supplier offers the service as a public utility, obliged to serve all qualified applicants without discrimination, the danger is inevitable that, in the absence of applicant's service, some who need this type of service could not get it. Certainly they would have no one from whom they could demand it as a matter of right, as they can from applicant if this tariff is accepted for filing. Being convinced by the record of the importance of this service to those who need it, we cannot escape the conclusion that public convenience and necessity require us to authorize the applicant to supply it."

Compensatory rates

The commission accepted the telephone company's evidence that the lease-maintenance mobile radio business would produce a 6.8 per cent return on the investment in equipment minus the depreciation reserve. It noted that competing companies charge about the same rates, excepting for the higher radio frequency stations, and that they find those prices adequate. The commission required the keeping of complete records of the costs of the private mobile radio service, as leased and maintained, by frequency bands. This will enable the commission in any future rate cases to be sure "that the regular telephone subscribers are not being required to make up any deficits." ■

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How several Tennessee communities formed their own utility district

GAS magazine is for private ownership of public utilities all the way, for that is the American way of doing business. Unfortunately, some cities have to wait for years before existing gas utilities desire to move in and pipe them for convenient gas service. Here is what several towns did about it.

By WILLIAM M. HOLMES, C.P.A.
Alexander & Holmes,
Dyersburg, Tenn.

GIBSON county is a predominantly agricultural county in west Tennessee, with cotton, corn and strawberries as its chief money crops. As is true of many areas in our southern states, industry has been moving into the county at an accelerated pace in recent years, tending to increase urban population and to form a broader economic base for the existence of towns in the under 10,000 population class. Gibson county towns have been most fortunate in having many civic leaders who have been dedicated to ideas of municipal progress and increased service to their fellow citizens.

As early as 1949, Mayors C. C. Berry of Dyer, J. O. Long of Trenton, and Floyd Burrow of Milan realized that the availability of natural gas would help attract industry and that the use of natural gas would be an economic saving for present residents. They petitioned the West Tennessee Gas Co., a private utility in Jackson, Tenn., whose natural gas transmission lines had already been extended to the town of Humboldt, to further extend their service to the towns of Dyer, Trenton, and Milan. This petition was refused.

The next proposal by the three mayors was to organize a Utility District under the Tennessee Utility District Act of 1937, and to purchase natural gas from Texas Gas Transmission Corp., whose

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transmission line passed within three miles of the Kenton town limits. This action was temporarily stymied by the fact that the act did not specifically include the organizing of a district to serve natural gas. In March 1951, the Tennessee legislature, at the instigation of this same group of mayors, amended the statutes to include natural gas distribution.

With this legal hurdle passed, petitions were circulated in the various towns requesting that a Gas Utility District be organized, and public hearings were advertised to allow objectors to be heard, as required by law. The petitions asserted the following facts and conclusions:

"1. That the gas transmission lines of the Texas Gas Transmission Corp. crossing Tennessee from south to north now pass within approximately three miles of Kenton, Tenn.

"2. That sufficient natural gas may be obtained from the Texas Gas Transmission to serve the inhabitants of the territory composing the proposed Utility District in which lie the incorporated towns of Kenton, Rutherford, Dyer, Trenton, and Milan.

"3. That the facilities of natural gas have proved to be competitive with fuel oil and coal for heating and cooking in every community in the state of which your petitioners have knowledge and that the creation of the district for this purpose is economically sound and desirable.

"4. That such a district will have no authority to levy or collect any taxes, but it will be authorized to issue bonds payable solely from the earnings of its facilities for the purpose of purchasing or constructing a natural gas distribution system.

"Your petitioners have had preliminary conferences with competent engineers and investment banks and are advised and believe:

"1. That it will be possible for the district to obtain an allotment of gas sufficient for its needs from the Texas Gas Transmission Corp.

"2. That the proposed district may be able to construct the gas distribution system extending from the transmission lines of the Texas Gas Transmission Corp. from a point near the town of Kenton, Tenn., to Milan, Rutherford, Dyer and Trenton, Tenn., at an estimated cost of $1500.

"3. That the proposed district can readily amortize the bonds necessary to be issued from earnings of a natural gas system.

"4. That the organization of the district and the acquisition of a natural gas system will greatly stimulate the growth and development of the district and that the services to be supplied by the proposed district are necessary for the public good and convenience and for the improvement of public health, safety, and general welfare of all persons owning real estate within the district."

On June 29, 1951, R. V. Atkins, judge of the county court of Gibson county, issued a certificate of convenience and necessity, and appointed the three mayors as commissioners of the newly created Gibson County Utility District. The first action of the com-

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mission was to increase its membership to five by the appointment of Mayor J. M. Warren of Kenton, and Mayor L, E. Haguewood of Rutherford as co-commissioners. The commissioners' terms of office are set on an overlapping basis, so that only one vacancy need be filled each year. The four remaining commissioners elect or re-elect the fifth commissioner each year. A commissioner can be removed from office only by the judge of the Gibson county court.

With the creation of the utility district and the appointment of commissioners, the problems of serving Gibson county communities with natural gas had only begun to be met. Three major problems had to met almost simultaneously.

First, bond attorneys and financing institutions were reluctant to approve and to bid on the district's bonds until a reputable firm of gas engineers had been retained to study the feasibility of and design the system, until a contract was let with a reputable contractor for construction of the system at a reasonable price, until an allocation of gas had been made by the Federal Power Commission.

Second, engineers and contractors were not anxious to commit themselves without some assurance that the district's bonds could be sold.

Third, the FPC was reluctant to make even a minimum gas allocation to an unknown municipal entity, especially in the face of opposition from large eastern municipalities which felt that continual draining of gas from the pipeline along its transmission route would curtail the supply eventually deliverable to them.

Inasmuch as the Gibson County Utility District was the first of its kind to be organized under Tennessee law to serve natural gas to a group of towns, every step taken by the commissioners was met by opposition. All of the commissioners gave generously of their time without financial recompense to meet and solve these problems.

On July 11, 1951 the commissioners signed a contract with J. C. Bradford & Co., Nashville, to act as fiscal agent in preparing the district's bonds for sale, including preparation of the bond resolution. On Aug. 1, 1951 they signed a contract with Barnard and Burk, consulting engineers, of Baton Rouge, to design and supervise construction of the gas transmission and distribution system. The Federal Power Commission rendered a favorable opinion and granted the necessary gas allocation on July 25, 1952. It was then necessary for the commissioners to obtain rights of way for transmission and distribution mains. On March 13, 1953, a contract was signed with Texas Gas Transmission for delivery of up to 2559 Mcf of natural gas per day. On April 7, 1953, the commissioners negotiated the sale of $1500 of 30-year serial revenue bonds with a coupon rate averaging 5 per cent. This high rate of interest for a tax-free municipal bond reflected the lack of confidence exhibited by various security dealers in this new operation. The construction contract was let on a negotiated basis on April 15,

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1953 to the firm of Patterson & Holmes Construction Co., Birmingham, for $974,238.79. Gas was turned on for the first delivery to consumers on October 1, 1953.

Residential rates instituted on that date and maintained since are: first 5 Mcf $.135 per hundred; next 15 Mcf $.08 per hundred; and over 20 Mcf $.07 per hundred.

Commercial and industrial rates are somewhat lower and are designed to promote increased use, especially in off-peak season.

The district maintains only one central office in Trenton, Tenn., from which service trucks are directed by short wave radio. Collections in each town are performed by one of the local banks for a nominal fee.

Since the beginning of operations, the district has enjoyed an exceptional rate of growth as evidenced by the increase in number of consumers from 1219 on June 30, 1954, to 1887 on June 30, 1955, and 2250 on June 30, 1956.

Financially, the efforts of the five commissioners and of the district's manager, Riley Brandon, have brought an excellent rate of return on both the district's rate base and on its invested capital. Earnings before allocation to reserves required by the bond resolution were $1863 for the part year ended June 30, 1954, $26,781 for the year ended June 30, 1955, and $62,593 for the year ended June 30, 1956.

The excellent experience of the Gibson County Utility District in its first three years of operation have induced the commissioners to expand the system into the towns of Bradford, Medina, and Gibson, whose distribution systems are being completed in time for the 1956-1957 heating season. Several other cities and towns of west Tennessee have also taken notice and formed gas utility districts in recent months, to obtain the benefits of combined operations. It is my opinion that the prime reason for the phenomenal success of the district's operation is the cooperation between, and dedication to the interests of the district by the commissioners representing the towns served, even after some had ceased to serve their towns as mayor. ■

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GAS news

Regulatory commissions studied by several states

Several state legislatures are considering bills calling for the formation or reorganization of public utility commissions.

In Iowa, legislators have proposed the creation of a new public service commission to regulate both publicly and privately owned utilities. The measure would abolish the present commerce commission, but not until terms of present elected members expire.

The proposed commission would regulate the rates and security issues of utilities. It would be supported by fees from the utilities—three fifths of 1 per cent of gross revenue.

A proposed state constitutional amendment in New Mexico would create a five-member state corporation commission. The measure would empower the state legislature to define and regulate all public utilities and would place utility regulation under the commission.

A companion bill would abolish the present appointive New Mexico Public Service Commission for the appointive SCC.

In New York, a bill has been introduced proposing the creation of a temporary state legislative commission to study and revise procedure of the state PSC and law.

A constitutional amendment and accompanying statute to provide a new public utility regulatory body for New Mexico have been introduced. The proposed legislation would set up a five-member, elected state corporation commission. The amendment, similar to one defeated in 1955, would merely set up the commission, while the state legislature would prescribe powers and duties of the agency and have the power to enact laws to regulate utilities.

Rate regulation of gas, electric and telephone service would be the task of a new Texas public utilities commission proposed by a state representative. Under the measure, the governor would name a three-member regulatory commission. At present, the state railroad commission acts on appeals from disputes involving gas rates set by cities.

An appointive rather than elective state corporation commission is proposed in Arizona.

Arizona's computer goes into operation

A cross section of Arizona Public Service Co. personnel can be found in the Phoenix company's new electronic computer section.

Previous jobs of the staff operating the Univac range from groundmen and surveyors to secretaries and engineers. Shortly after the company announced it was purchasing the system, job applications were accepted from 300 employees who wished to enter the field of electronic data processing. From this number, the company was able to recruit 80 per cent of the 40 people it takes to staff the operation.

Following acceptance into the program, the employees were each

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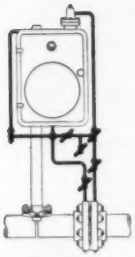

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given an eight-week course in computer coding and programming. In addition to the coder trainees, three men were sent to Philadelphia where they took a five-month course in computer engineering. At present they are conducting a similar course in Phoenix to train an additional three men in this field. Three graduates of the coder school took additional training at the Remington Rand service center in Los Angeles to become operators.

The Univac will serve as a general tool of management by Arizona Public Service, which will use it in five fields of company operations: revenue accounting, vehicle accounting, plant accounting, stores accounting, and payroll.

When Arizona Public Service Co., Phoenix, announced its purchase of a new electronic computer, 300 employees expressed a desire to enter the field of electronics data processing. From this number, the company recruited 80 per cent of the 40 people it takes to staff the computer operation. Shown here is the heart of the computer.

Initial concentration has been placed on revenue accounting. The company expects its pilot program, encompassing some 7500 customers of the company's western division, to be converted this month. At this time the pilot program will be checked for accuracy by a duplicate operation under the company's present method of billing. Following this, the entire revenue accounting operation will be converted to Univac with the other four fields incorporated into the system shortly thereafter.

Gas generates electricity in Pacific Northwest

Natural gas will be used to generate a small part of the Pacific Northwest's electricity for the first time this summer. It will supplant wood residue for about two-fifths of the 85,000-kilowatt capacity of Portland (Ore.) General Electric Co.'s steam-electric plant.

The electric utility has contracted with Portland Gas & Coke Co. for up to 30,000 therms of natural gas daily at the mid-city standby plant. The fuel will be on an interruptible basis.

Two large boilers will be converted from hog fuel to a dual-burner system designed for gas. However, it will be convertible to

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heavy oil when firm customers of Portland Gas need the fuel.

Nearly all of Portland Gas' allotted interruptible gas has been sold on five-year contracts to more than 25 industries in the metropolitan area. Maximum-day load for industrials thus far signed adds up to more than 547,000 therms. On the basis of an expected 90 per cent delivery, their consumption will amount to as much as 118.8 million therms a year, three times Gasco's sales to all of its customers last year.

Latest industries to sign up for natural gas are Oregon Steel Mills, Becco in Vancouver, American Bitumals, and Swift & Co.

$35 million bond issue registered by United Gas

United Gas Corp. has entered a registration statement for $35 million of first mortgage and collateral trust bonds with the Securities & Exchange Commission. The obligations, due in 1977, are to be offered publicly at competitive bidding.

About $30 million of the proceeds from the proposed sale would be used to purchase first mortgage bonds of the United Gas subsidiary, United Gas Pipe Line Co. The pipeline company will use most of these funds to redeem $25 million of its own outstanding debentures held by the parent company.

Consolidated net income of the Shreveport-headquartered firm rose in 1956 to $29,387,842, equal to $2.28 a share, from $26,155,913, or $2.03 a share, for the previous year.

Gross revenues for the year ended Dec. 31 amounted to $272.9 million, a $33 million gain from 1955. The company attributed the rise principally to increased sales of gas, which last year totaled 1252 billion cu ft, a gain of 103 billion over 1955.

More than 22,000 residential, commercial and small industrial gas customers were added during 1956.

Binghamton, Keystone merger has PSC okay

New York's Public Service Commission has approved the consolidation of Binghamton Gas Works and Keystone Gas Co. Inc. into a new firm—Columbia Gas of New York Inc.

At present, Binghamton serves about 44,000 customers in Binghamton and other Broome county

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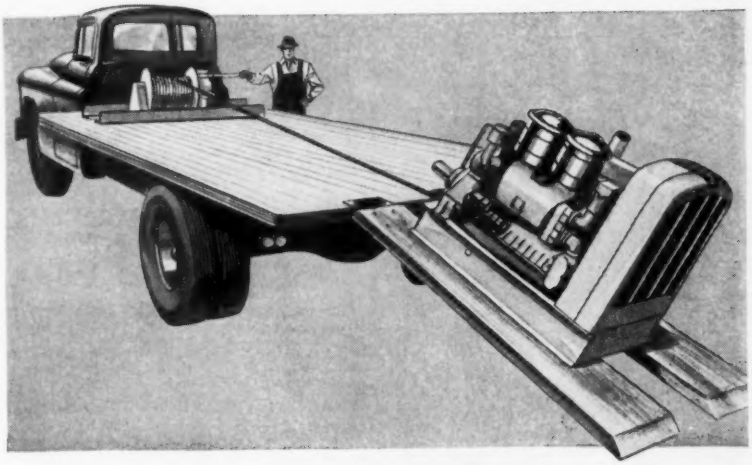

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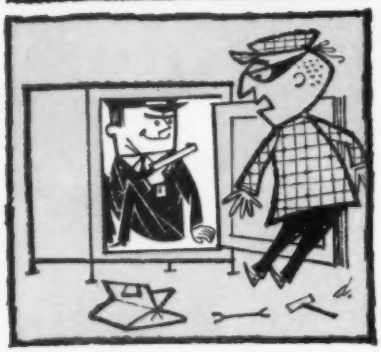

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communities. Keystone has about 11,400 customers in western and central New York.

The PSC said Binghamton would be permitted to increase its issuable shares of $25 par value common stock from 80,000 to 140,000. Then it will issue 22,152 shares of stock to Columbia Gas System Inc. in exchange for 10,000 shares of Keystone stock now held by Columbia.

Municipal gas bill okayed by Idaho house

A bill permitting muncipalities to build, operate, and own their own gas distribution facilities has been approved by the Idaho house of representatives. It is now in the senate.

Under the bill, towns and cities would be empowered to issue bonds for such purposes. The bill would add a section to the Idaho code governing issuance of municipal bonds to make the code specifically include natural gas systems.

One of the sponsors of the bill, Rep. Perry Swisher, was a leader in a movement to enable municipalities to obtain gas facilities through cooperative venture. This form, however, was declared unconstitutional by the state supreme court.

Laclede's storage challenged again

Suit seeking to prevent Laclede Gas Co. from using an underground reservoir in north St. Louis county, where it has been storing gas since December 1955, has been filed in circuit court in Clayton, Mo.

The suit seeks to restrain Laclede from using the present underground facility or expanding it. A declaratory judgment invalidating PSC orders authorizing the storage and declaring unconstitutional a state law permitting underground storage also was sought, as were damages of an unspecified amount.

Laclede's underground storage project was first approved in 1954 by the Missouri Public Service Commission. Its location was opposed by many residents of the area and was subject of involved litigation. Laclede eliminated a major obstacle in 1955 by agreeing to pay some objecting property owners annual rental instead of a lump sum for storage rights.

Sendout records fall as winter hits hard

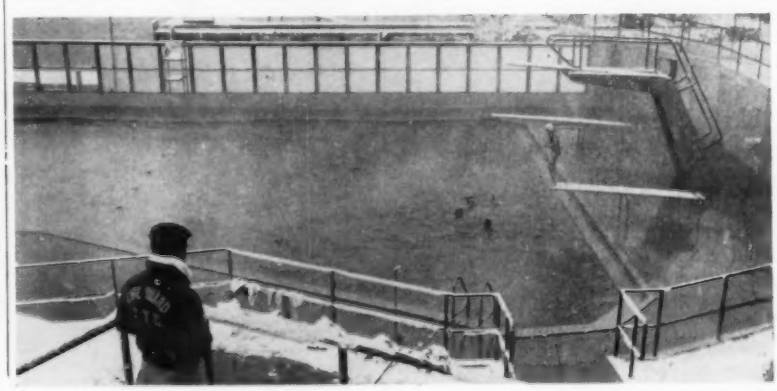
Several sendout records were established in widespread sections of the country during cold spells late in January (see Highlights, March *Gas*).

In Chicago, Peoples Gas Light & Coke Co. set a new seven-day high when 33.7 million therms of 1000 Btu gas was burned. This is a 47.45 per cent increase from the 22.9 million therms sent out during 1956's record-breaking week.

Sendouts for five separate days in January broke all existing records. The previous daily record was set in December 1955—4.6 million therms. This figure wasn't left standing long following Jan. 10 when 4.8 million therms were used. The trend finally reached its height

---

Mittens and snow suits have been discarded in favor of summertime swim suits by members of the Seattle Tennis Club, who are now swimming in a pool heated to 75 to 78° by natural gas. Washington Natural Gas Co. says it takes about 1.5 million Btu of gas hourly to hold the temperature constant when the outside air is a cold 20°F. An American Radiator low pressure cast iron sectional boiler, rated at 4,680,000 Btu/hr, supplies the heat.



when almost 5.5 million therms were sent out on Jan. 16.

In southern California late in January the usually mild weather suddenly turned cold and Southern California and Southern Counties Gas companies sent out nearly 2 billion cu ft of gas to warm its cold customers. This figure surpassed by 200 MMcf the previous high set just a few days before when 1.6 billion cu ft went out.

Columbia selling stock to finance '57 expansion

The Columbia Gas System Inc., New York, will sell 1.5 million shares of common stock this month as the first step in financing the 1957 construction program of its subsidiaries.

George S. Young, Columbia's president, said that it was the intention to sell the shares at competitive bidding for public distribution. He said that the company was not departing permanently from its usual procedure of offering new common stock to its stockholders, but it had decided, after a thorough study, that it would be best at this time to sell the new stock directly to the public.

Columbia plans to spend $87 million this year on construction, compared to the $61.7 million spent last year for new facilities and replacements.

Conservation bill pending in Nebraska

A bill introduced in the Nebraska legislature proposes a commission to regulate oil and gas drilling and production to prevent waste.

While it would have no power to fix prices, the conservation commission could allocate production quotas among various wells in an oil or gas pool. Oil or gas produced in excess of the commission's regulations would be subject to seizure and sale as contraband. The commission would be supported by a tax not exceeding two fifths of a cent on each dollar of the wellhead value of oil or gas produced.

Buying opportunity offered by Lone Star

Lone Star Gas Co., Dallas, has filed a registration statement covering 154,834 shares of convertible preferred stock with the Securities & Exchange Commission.

The proposed offering of rights to subscribe at a price of $100 per

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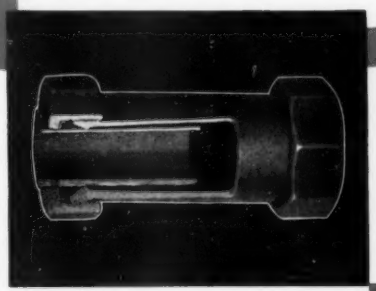

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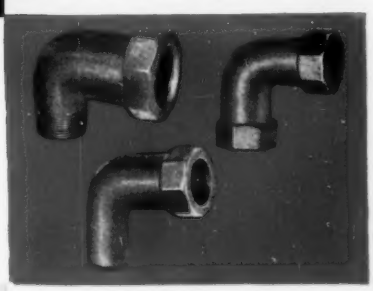
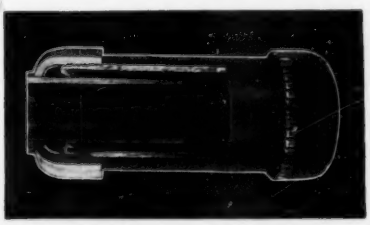
Normac malleable couplings and sleeves offer the ultimate in deflection and strength with a center wall thickness greater than the wall thickness of the service pipe on which they are used. Every Normac fitting is individually air tested.



COMPRESSION-END "ELLS"
Normac ells of all types incorporate every feature of the Normac coupling plus full coupling depth.

COMPRESSION-END SERVICE "TEE"
Full coupling depth. Special threads on male end prevent dropping into old hand taps.



NORMAC #60-A STEEL COUPLINGS
Manufactured from extra heavy wall pipe. Couplings are available with either seamless or welded centers in sizes from ¾" to 1½" inclusive. 10" and special length centers available.

Normac also manufactures a complete line of red brass fittings in O.D. sizes: ⅝", ⅞", 1⅛", 1⅜"—and a complete line of insulated couplings and fittings.

NORTON-McMURRAY MFG. CO.
122 South Michigan Avenue — Chicago 3, Illinois

share for $100 par value stock was made to the company's common stockholders on the basis of one share of the new preferred stock for each 40 shares of common stock held.

A group headed by the First Boston Corp. will purchase any unsubscribed shares at the termination of the offer.

Net proceeds from the sale will be used, together with cash on hand, to pay Lone Star's current bank borrowings, presently totaling $20 million made to provide a portion of the funds for the 1955 and 1956 construction programs.

Gains expected by appliance manufacturers

Seven out of 10 manufacturers of household gas appliances and equipment expect to sell more in 1957 than in 1956 while only one in 10 anticipates a decrease.

Edward R. Martin, director of marketing and statistics for the Gas Appliance Manufacturers Association, reports that of the 312 member companies surveyed, 220 manufacturers of gas ranges, water heaters, heating equipment, clothes dryers and incinerators expect increased volume, 23 expect to duplicate 1956, 32 anticipate a drop, and 37 offer no estimate.

The consensus, Mr. Martin said, is that the industry will sell more than 8.5 million units. However, he added, the figure could top 9.5 million if all individual manufacturers were to achieve their own company expectations.

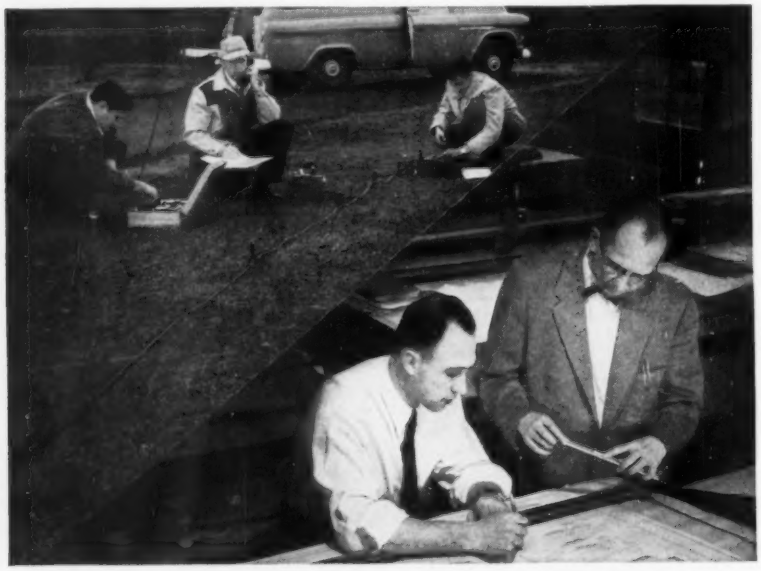
Among the most optimistic forecasters are the makers of automatic gas water heaters, who set an all-time record in 1956 with shipments of 2,773,600 units. The new peak—0.9 per cent over the 1955 high—was achieved despite a dip accompanying a slower pace in home building during the second half of the year.

Forty-one water heater men expect to top the '56 figure, reaching 2,844,000 units this year. Mr. Martin pointed out however that individual company expectations—with 28 companies looking for increases — indicate that the total may pass the 3 million mark for the first time, and may even go as high as 3,150,000.

Gas range manufacturers expect little change in the sale of conventional, free-standing ranges, which dipped 11.4 per cent in 1956 from the 2,266,600 total in 1955. However, makers of built-ins expect to establish new sales records despite forecasts of further drops in new home starts. In 1956, 160,000 built-ins were shipped and 27 companies surveyed expect that the industry will ship 2,227,000 units this year. Here again, Mr. Martin pointed out, industry predictions lag behind the sum of individual company expectations, which indicate that shipments may rise as much as 13 per cent above 1956 and exceed 2.4 million units.

Makers of gas central heating equipment, whose sales established gas as the nation's No. 1 domestic heating fuel in 1956, expect to hit a new all-time high this year, topping the million-unit mark for the third consecutive year.

Forty-nine of 63 reporting manufacturers of gas warm air furnaces expect sales increases. Twenty-four of 32 boiler manufacturers look for larger volume, and 27 of 42 conversion burner makers also expect to beat the 1956 figures. The industry-wide estimate is that the combined central heating total will be 1,149,000 units, made up of



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840,000 furnaces, 106,000 boilers, and 203,000 conversion burners.

Individual company predictions indicate the total might reach 1,227,000 units—900,000 furnaces, 115,000 boilers, and 212,000 conversion burners.

Two relatively new gas appliances, clothes dryers and incinerators, are likely to hit new highs this year. Thirteen of 17 incinerator makers expect increases that could place the total 28 per cent above 1956. Gas clothes dryers are expected to climb from the 1956 total of 470,000 units to 571,000.

Scholarships set up by Northern Illinois

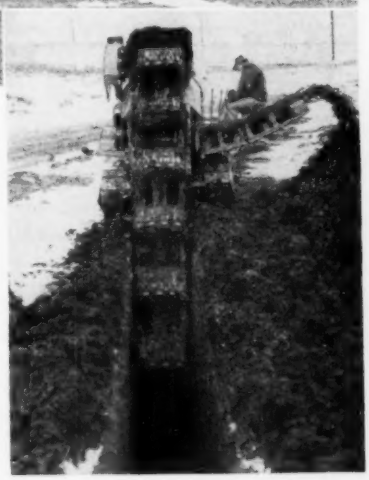
Two four-year college scholarships are being sponsored by Northern Illinois Gas Co., Bellwood, Ill.

The scholarships, awarded through the National Merit Scholarship Corp., will go to 1957 high school graduates who are residents in the northern Illinois territory served by the utility, and who plan to attend any of 16 Illinois colleges and universities included in the company's program.

According to Marvin Chandler, Northern Illinois president, at least one of the scholarships will be given to a student intending to pursue an engineering course. Preference for one of the awards will

The new seven story, aluminum panel office building of Pioneer Natural Gas Co. is topped with a 16-ft gas flame. The Amarillo building houses the company's general offices. Gas-fired air conditioning with individual temperature controls in each room, electronically controlled passenger elevators, hot water coils in the sidewalks to prevent accumulation of snow, and roof-top parking facilities for employees are features of the building.

Low and narrow for utility trenching



Look at the low profile of this small 155 Parsons Trenchliner! Working height is only 7 feet-4 inches. This lets it work under trees, over-hanging limbs where larger trenchers can't go. Width over crawlers is only 5 feet-4 inches for operating between buildings, in narrow alleys, and other restricted areas.

Close side-clearance puts trench within 21 inches of fences, poles, walls. Power-shift spoil conveyor dodges side obstructions. Belt direction is instantly reversible — places spoil bank on either side of trench. For all its compactness, you will be surprised at the capacity of this utility-size Trenchliner:

Digs 16 to 26 inches wide — 10 feet deep. It has 30 digging speeds (60 optional) from 5.8 inches up to 25 feet per minute. Low range lets the 155 "inch" its way past cross-pipes, through rock. High range gives top output on open terrain.

Sloping boom undercuts walks, curbs, gutters, makes vertical set-ins flush with main lines or foundation walls. Positive down-crowd with hydraulic control starts cut fast, holds accurate grade. In fact, this small 155 has all the heavy-duty characteristics of larger Parsons Trenchliners.

It's heavy-duty in every detail — has cast-steel buckets, "Tap-In" teeth, spring-cushioned bucket cleaner, fully enclosed gearing, tractor type crawlers with 16-inch grouser treads, 12-inch flat shoes optional, gas or diesel power. Call your Parsons distributor for complete facts. (Larger ladder or wheel-type Trenchliners are available on crawlers; also the mobile rubber-tired Trenchmobile®.)

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be given to a child of a Northern Illinois Gas employee who is determined eligible by the National Merit Scholarship Corp.

SoCounties installed 47,643 meters in '56

With the 47,643 meters added in 1956 by Southern Counties Gas Co., customers now number close to 600,000 for the Los Angeles utility.

Number of meter additions—representing an average of 3.25 persons served—was the second highest yearly total in the 46-year history of the company. It was topped only by the 50,639 meters added in 1955, according to J. Q. Abel, controller and treasurer of SoCounties.

The company expects to add 57,000 meters in 1957.

Security Valve Corp. doubles plant capacity

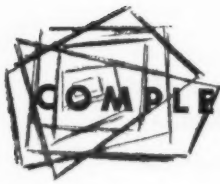
Security Valve Corp., Glendale, Calif., manufacturers of automatic shutoff valves, has acquired additional buildings which will double plant and production facilities.

At the same time, the company announced the appointment of William C. Johnson as chief engineer. Mr. Johnson is a graduate of the School of Mechanical Engineering at the University of California at Los Angeles, and his experience dates back 10 years. It covers design and work with high pressure regulators and high pressure pipeline equipment for a variety of industries. He has been active in the guided missile program in the development of Nike.

W. C. Johnson

Washington Natural plans $21.5 million financing

Directors of Washington Natural Gas Co. authorized financing totaling $21.5 million, which, according to President Charles M. Sturkey, is the largest "package"



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in the company's history.

Most of the amount will go toward expansion of the company's system, including $6.5 million for 1957, construction. Present outstanding bonds and bank loans will be refunded, Mr. Sturkey said.

Action by the directors approved the sale of the bonds, for which commitments have been made to insurance companies. They also authorized application to the Washington PSC for certification to permit the transaction.

New financing will be used to expand the distribution system throughout Washington Natural's service area, extending from Marysville to Centralia-Chehalis, inclusive. Natural gas will be brought to Marysville and a distribution system built; a lateral will be extended from the pipeline to the Olympia and Tumwater area to serve those cities.

GAS news notes

Consumers Power Co., Jackson, Mich., is seeking Michigan PSC permission to issue and sell 549,324 shares of its authorized but unissued common stock. Present shareowners and employees of both Consumers and its subsidiary, Michigan Gas Storage, will be given opportunities to buy. Proceeds of the sale, estimated at $24 million, will be used to finance expansion and improvement in the company's service area.

The Berry Division of Oliver Iron & Steel Corp., Pittsburgh, has changed its name to Berry Hydraulics. The main plant of the division, which was merged with Oliver Tyrone Corp. in January of this year, is located at Corinth, Miss.

Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y., plans to spend $50 million during the next three years to meet increasing demands for natural gas and electricity in its service area. The 1957 budget of the company includes a $2 million allotment for a 50-mile line from Kingston, N. Y., to near Albany, where it will tie in with Tennessee Gas Transmission Co. facilities.

Cleveland Trencher Co. has appointed E. H. Kliebenstein Co., Ridgefield, N. J., as distributor for the complete line of Cleveland trenchers, sidecranes, backfillers, and tampers for northern New Jersey.

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New Products and Trade Literature

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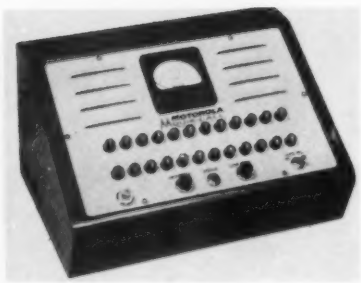


1. Single-unit console

A new single-unit console from Motorola provides complete selective calling facilities for land-mobile two-way radio base station installations.

Recently added to the company's Quik-Call selective signaling line, the new console combines all tone signaling elements — tone generator, timer, power supply and code selector—in a single compact package. The console can be quickly and easily added to any existing two-way radio system, regardless of make or model.

With the addition of selective calling facilities, a mobile receiver in a two-way system responds only to calls specifically directed to it and is silenced to all other traffic on the channel.
Motorola Inc.

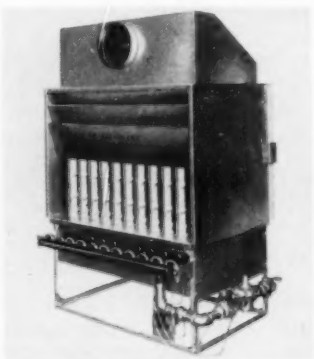
---

2. Concrete coating

A new concrete coating process for use on pipe ranging from 4 in. to 30 in. is available from Mallard & Hinkle.

Prepared and sacked material weighted to customer specifications is used. Carefully designed and engineered wrap-around forms with reinforcing mesh and banding material, combined with a special spacer form arrangement, are components of this process, named Form-Crete.

The materials for the process are offered on either a do-it-yourself rental basis with weighting material supplied presacked, or the whole service is available.
Mallard & Hinkle



3. Commercial furnace

An aluminized duct furnace for commercial and industrial applications has been added to the Payne Co. line of forced air, space heating, and air conditioning equipment.

The new furnace will be available in four basic sizes, ranging from 200,000 to 440,000 Btu inputs. Outstanding feature of the new furnace is its aluminized heat exchanger, which is said to have high corrosion resistance.

AGA-approved for as low as 50° temperature rise through the furnace, the new ADF line can be used in combinations up to 1,760,000 Btu input per hour.
Payne Co.

---

4. Enlarged gate valves

Longer end - to - end dimensions for its cast steel gate valves for butt welding are announced by Crane Co.

The increase applies to Crane's 150-lb gate valves in sizes from 2 through 24 in. According to the company, the increase in dimension offers greater protection to seating areas against heat distortion during the welding of line connections.

A 2-in. valve will now measure 8½ in. end to end, a 10-in. valve is 18 in. end to end, and a 24-in. valve measures 32 in. end to end.
Crane Co.

---

5. Wide-roll cutter

Easier and better pipe cutting with a power drive is offered in a new Ridgid tool from Ridge Tool Co.

Extra wide roll built into the 202 cutter features double the bearing surface on pipe. New wide-roll sets and holds revolving pipe at a perfect right angle. The user is

thus assured of quick, clean starts for perfect tracking and straight cuts.

Large screw handle assures easier cutting adjustment for hand or power use. Extended shank protects screw threads from damage, and gives greater thread bearing surface.
Ridge Tool Co.

6. Water heater

A new gas-fired water heater has been especially designed to meet heating requirements for the rapidly expanding swimming pool market.

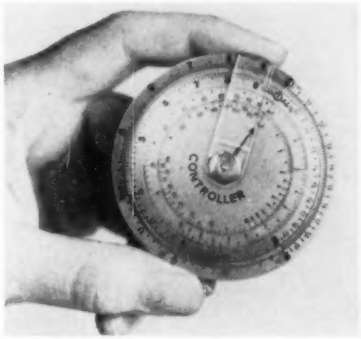
A. O. Smith's newest Burkay heater, styled in round or square jackets, is a handsome pool-side addition. The weather-resistant outer shell completely encloses the controls.

Having inputs from 110,000 to 420,000 Btu/hr, the swimming pool heater models are sized for pools from 10,000- to 40,000-gal. classes. Multiple installations are used for larger pools. Pool temperatures are raised in a 24-hr period from the too-cool 50 to 60° of most water supply systems to the 75 to 85° temperatures most people need to enjoy swimming.
A. O. Smith Corp.

7. Radio-telephone

A new mobile AM radio-telephone from Kaar Engineering has been designed to provide reliable long distance communications under adverse terrain conditions. Designated the TR 245, this 50-watt, 2-way unit handles field communications in oil exploration, pipelines, geological survey, etc.

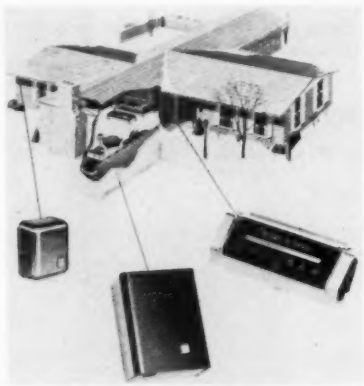
Easily installed in cars, trucks, jeeps, or other vehicles, the 245 uses a frequency range of 1.6-8 mc and features strip chassis construction for easy maintenance, optional dual channel operation, and 6- or 12-volt operation without modification. The transmitter features include quick-heating tubes (PA and modulator), a pi output network, and a speech clipper and filter. Delayed and amplified AVC, automatic noise limiter, and a positive squelch circuit are featured in the receiver.
Kaar Engineering Corp.



8. Calculator

A new pocket-size calculator distributed by Silver Bells Ltd. performs the same functions as a 10-in. slide rule, but is only 3 in. in diameter.

The aluminum Controller-Calculator does all commercial and technical calculations, including fuel consumption, percentage, speeds, areas, volumes, squares, cubes, etc.
Silver Bells Ltd.



9. Temperature control

Thermally sensitive resistors, "Thermistors," are the important element in Detroit Controls' new indoor-outdoor temperature control system called the Weather Minder.

Mounted outside the home, the thermistor unit signals temperature changes (to within a fraction of a degree) to the control panel that serves as a central control between the room thermostat, the thermistor outdoor unit, and the heating unit.

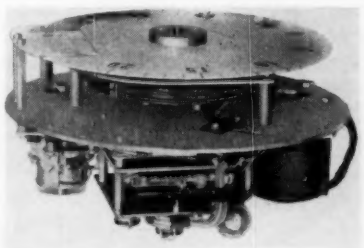
With these three units, the Weather Minder automatically raises indoor temperatures as the outdoor temperature falls. Conversely it lowers indoor temperature during mild weather.
Detroit Controls Corp.

10. Sealing compound

A new thread sealing compound —Rectorseal 5—that dries slowly and sets soft has recently been perfected by Rectorseal Division of Rector Well Equipment Co.

This new sealing compound is particularly suited for assembly line connection work since it will not dry in the open can. It will not harden with age under recommended service conditions. Containing no lead or other metals, the compound's plastic elasticity allows joints to be broken easily at any time without damage to threads.

According to the company, field tests have shown the compound to be excellent for piping connections carrying natural gas, manufactured gas, air, butane, propane, etc.
Rector Well Equipment Co.

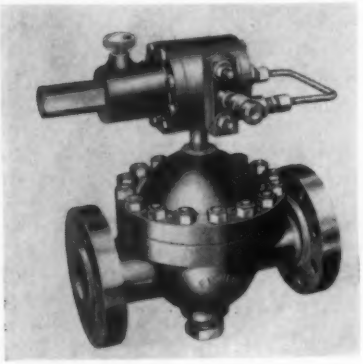


11. Potentiometer

Bristol Co.'s new self-balancing electronic potentiometer servomechanism has been designed to be built into a user's equipment.

The mechanism consists of a group of standard Dynamaster instrument parts assembled on a circular base, and fitted with an indicating scale. When used with a Bristol amplifier, input transformer, and Syncroverter d-c a-c inverter, it forms a complete self-balancing dial indicator.

Applications of the new mechanism include use as a low-cost indicating pyrometer, resistance thermometer, or potentiometer to be incorporated into user's equipment; as a replacement for a direct deflecting d-c milliammeter or millivoltmeter; or for use as a self-balancing unit to operate analog-to-digital conversion mechanisms for readout.
Bristol Co.



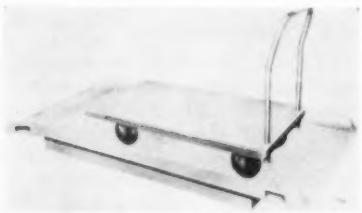
12. Relief valve

In a new relief valve from Fisher Governor Co. the main valve has only one moving part—the rubber diaphragm—which flexes to open or close the valve.

Known as the Dia-Grid, this pilot-operated relief valve provides positive shutoff operation, is rugged, compact, accurate and easy to maintain. It is available in 2-, 4-, 6-, and 8-in. connections with flange ratings of 150, 300 and 600 lb.

One pilot is available for use with the Dia-Grid for safety relief service at compressor, town border and district regulator stations. It can be adjusted for relief ranges from 10 to 600 psi.

Fisher Governor Co.



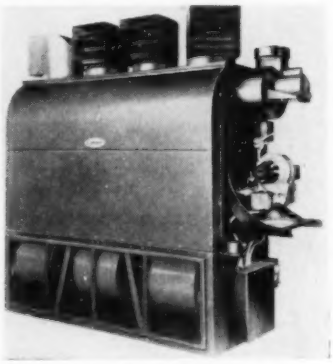
13. Hand trucks

Handling of materials is made easier, safer, and more economical with a new line of aluminum hand trucks and dock boards.

Developed by Voltz Brothers Inc., the Met-L-Lite line of hand trucks has a formed aluminum deck with rounded corners and an adjustable wheelbase for short or long turning radius. This radius adjustment permits the truck to turn on its own axis. The dock boards have safety tread plate, rounded extruded curbings with hand grips, and beveled edges for easier approaches.

Trucks are available in standard sizes—widths from 24 to 40 in. and lengths from 36 to 72 in. with capacities to 2000 lb.

Voltz Brothers Inc.



14. Central heating plant

No central boiler is required in Carrier Corp.'s new central heating plant for schools, churches, warehouses, and other large-area buildings.

Carrier's new line of direct-fired heat diffusers offers a wide choice of installation, ranging from wall or ceiling suspensions to floor mountings. The unit operates at high efficiency, converting at least 80 per cent of its consumed fuel into usable heat.

Available in 10 sizes ranging from 300,000 Btu up to 2 million Btu.

Carrier Corp.

---

15. Pressure transmitter

Pressures of 0-30 in. of water to 0-6000 psi are measured by a new Foxboro indicating pressure transmitter, which also transmits a 3-15 psi air signal to indicating, recording or controlling instruments.

A choice of standard Foxboro pressure elements to accommodate the various ranges is offered—spirals, helicals, bellows, and diaphragms; element materials are available for corrosive process fluids. The transmitter has an eccentric indicating scale built into the front of the case.

Foxboro Co.

---

16. Dehydrator

Designed for removing water vapor from compressed gases is a desiccant-type dehydrator from King Engineering Corp. Designed for use in instrument lines, the air dryer works with compressed gases serving liquid level gauges, louver and damper operators, air valves and other pneumatic equipment on dead end or low flow service in remote locations.

The air dryer provides a dew point of −60° F or lower, can be used at a gauge pressure of 100 psi, and has a capacity of 60 scfh at 70°F. It consists of a head, a case, and a desiccant cartdirge.

King Engineering Corp.

---

17. Coating

Tough resilient protection against abrasion, weathering, and chemical corrosion is provided by a new coating from West Chester Chemical Co.

Named "Maintz," the new coating is based on DuPont's chlorosulfonated polyethylene, which in combination with silicone and other resins produces a tough and long lasting coating. According to the company, it has sufficient elasticity to withstand extremes of expansion or contraction without cracking and retains this property at temperatures as low as −40°.

Maintz is particularly suited for protection of both buildings and equipment in refineries, chemical plants, smelters, marine service or any other locations where severe conditions present problems in maintaining a protective coating.

West Chester Chemical Co.

---

18. Frequency meter

Multiple transmitter installations operating on from one to 20 channels in mobile radio communications systems can be serviced by a new frequency meter developed by Allen B. Du Mont Laboratories.

Type 5890-A frequency meter is portable and features transistorized circuitry. It can be used with any transmitter operating within the complete land-mobile services' frequency bands—25 mc to 470 mc.

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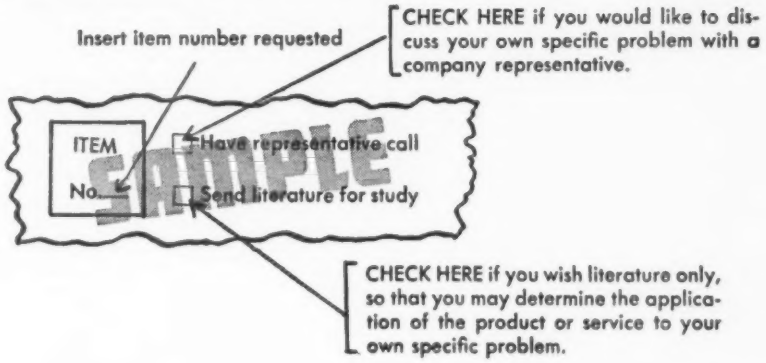
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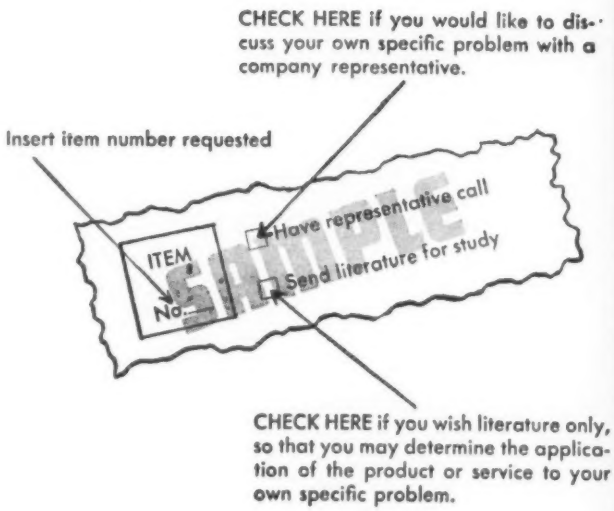
CHECK HERE if you would like to discuss your own specific problem with a company representative.
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In addition to measuring basic transmitter frequencies, the crystal-controlled meter is a highly stable source for associated receiver alignment and for setting transmitter modulation deviation.
Allen B. Du Mont

19. Limit control

Designed for fast acting precision control of critical temperatures is Partlow Corp.'s new Model HL 15-10 high-temperature limit control.

The control acts to cut off the heat supply if a predetermined temperature, set on the calibrated scale, is exceeded. It protects against loss or damage to equipment or work being processed. Temperature of the process is indicated at all times by a black pointer against the calibrated scale.
Partlow Corp.

20. Solenoid Valve

Engineered for the automatic control of gas, air, water, solvents, etc., is a new, normally open solenoid valve from Magnatrol Valve.

Designated Type AR, the new valve has full-port capacity and is available in sizes from ½ to 3 in. with pressure ratings to 300 psi. It is cast of high pressure valve bronze in the globe pattern. Single-seated, the valve is closed by a standard Jenkins-size resilient disc. The upper part of the disc holder forms the operating piston, which is controlled by a stainless steel pilot valve. The valve opens instantly when the solenoid is energized. In opening, a quick-acting spring insures positive action. In high-pressure applications, the line pressure assists the spring in providing instantaneous opening.
Magnatrol Valve Corp.

TRADE LITERATURE

21. Meter tips

Lancaster Meter Co.'s house organ, "Meter Tips and Shop Tricks," presents interesting and helpful meter shop tricks, illustrated with humorous cartoons. The publication, recently expanded to four pages, is punched to fit Lancaster's looseleaf catalog on diaphragms and other meter replacement parts. The back page is devoted to a chapter from "Meter Shop Repair Manual," written by the company's chief engineer, Ed Gilmore.
Lancaster Meter Co.

22. Conversion chart

A wall chart of conversion factors has been published by Precision Equipment Co. Included are common conversions such as inches to centimeters or watts to hp, as well as many conversions that are difficult to locate in reference manuals.
Precision Equipment Co.

23. Continuous furnaces

Standard rated continuous heat treating furnaces are described and illustrated in a new bulletin from Surface Combustion Corp. The four-page, two-color publication (SC-177) contains specifications, process recommendation and application examples for Surface snap hearth, cast alloy link belt, and brazing furnaces.
Surface Combustion Corp.

24. Water heater institute

Ruud's Institute of Gas Water Heater Engineering is the subject of an eight-page folder. The objectives, facilities, equipment and curriculum of the school are discussed. It points out that the training course is open to those working in the commercial gas water heating field as gas utility, LPG, plumbing wholesaler and retailer executives or representatives, as well as independent architects and engineers.
Ruud Manufacturing Co.

25. Conversion chart

A handy temperature conversion chart is being offered by Moeller Instrument Co. The easy-to-read tables of Fahrenheit and centigrade temperature equivalents are a time saver for those having frequent occasion to convert from one temperature to the other. The chart measures 8½ in. x 3½ in.
Moeller Instrument Co.

26. Temperature control

Burling Instrument's temperature control, which may be used on either liquids or gases and for temperatures up to 1000°F, is discussed in a new bulletin. Included are a description of its differential expansion operation, specifications giving temperature ranges, tube sizes, and accuracy.
Burling Instrument Co.

27. Elevator file

Diebold's motorized super elevator file, "a new dimension in mass record handling," is described in a new piece of literature. The 10-page catalog describes the newest addition to the line, the Super 63, which features a slanting silhouette. The file accommodates a wide range of record sizes—more than 200,000 5- x 3-in. records require less than 23 sq ft of space.
Diebold Inc.

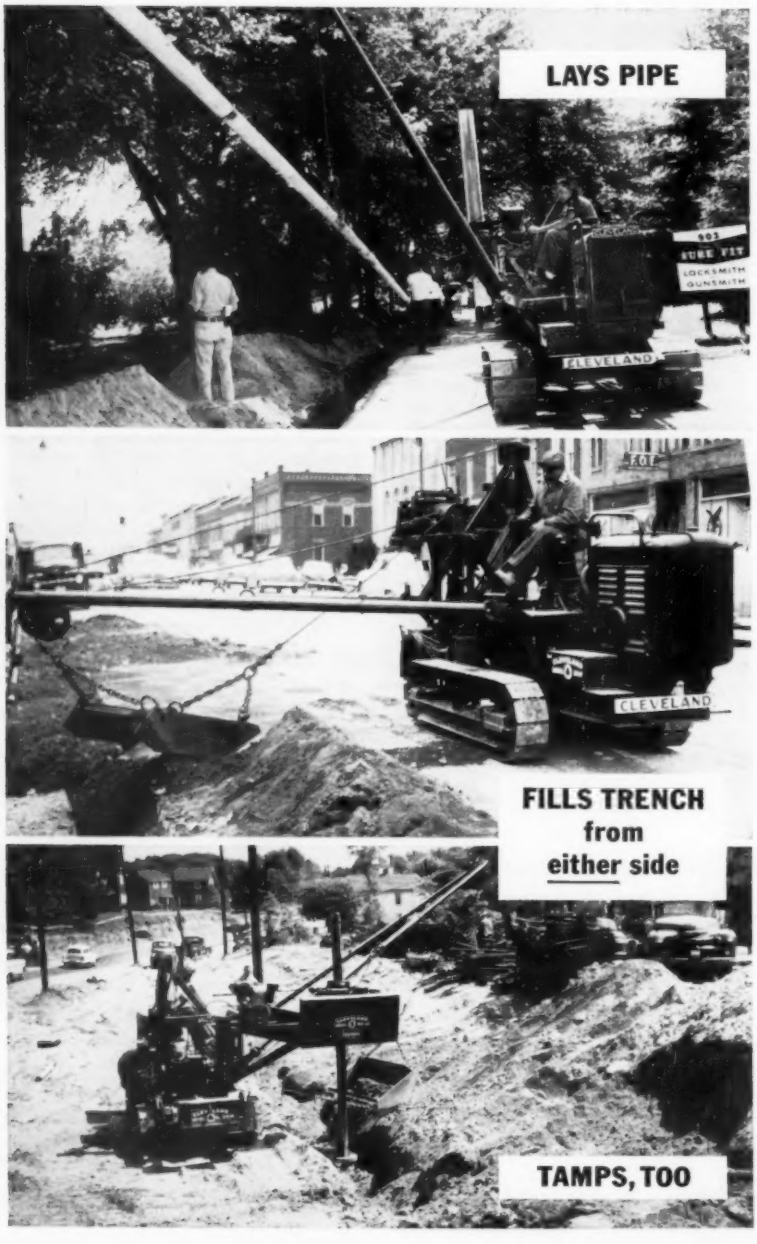
28. Range Thermostat

A combination thermostat specially designed for use on gas ranges containing a section for room heating is described in a bulletin from Robertshaw-Fulton. Bulletin RT-784 contains a detailed cutaway drawing of the control, as well as diagrams for installation.
Robertshaw-Fulton Controls Co.

29. Valve lubricant

More detailed lubricant selection data, including information about 80 new lubricants, are presented in a new 12-page version of Rockwell Manufacturing Co.'s bulletin on "Lubricants for Rockwell-Nordstrom Valves." Featured are four new lubricants not listed in previous bulletins.
Rockwell Manufacturing Co.

The Cleveland 80W
...a real money maker



Does All 3 Jobs Better...with Only 1 Man

THE CLEVELAND TRENCHER CO.

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

Good Everywhere

Canadian Report
Continued from page 62

plus its own dwindling production from once-flourishing wells in southwestern Ontario.

Natural gas is by no means a stranger to southwestern Ontario, service having begun more than 60 years ago following a discovery well, brought in on Jan. 23, 1889, in Essex county, about 15 miles from Windsor. By 1894 some 30 wells had been brought in and an 8-in. pipeline was laid to Windsor. A year later a pipeline was laid across the Detroit river and gas was sold to Detroit. In 1898 the line was extended as far south as Toledo.

Some 90 or 100 wells were brought in during the next few years, but the field turned out to be too small to withstand the load placed upon it by these markets and it was abandoned in 1904. However, in 1906 the Tilbury field was discovered by the Volcanic Oil & Gas Co. As of today this field has produced in excess of 225 billion cu ft of gas.

The new discovery brought about a flurry of activity and a number of companies were formed to supply markets in the area. On Dec. 19, 1911, the Union Gas Co. of Canada Ltd. was formed, amalgamating the interests of the Volcanic Oil & Gas Co., Ridgetown Fuel Supply Co., and the Rondeau Oil & Gas Co.

The new company grew rapidly and within 20 years had incorporated into its system gas production, transmission and distribution plants in a number of southwestern Ontario cities. Although the company continued to explore for and develop new natural gas fields, it failed to keep up with the demands of the company's service area. In 1943 negotiations were opened to purchase natural gas from the United States, and this source was tapped first in 1949. Increasing volumes of gas have been purchased each year, and since 1952 the company has received the full annual contract volume of 5.5 billion cu ft. The supply of gas from the States plus the company's own production has permitted an expansion in sales which have risen from slightly

under 6 billion cu ft in 1950 to more than 13 billion cu ft in the fiscal year ending March 1956. In the same period the number of meters on the company's lines has increased from 73,000 to nearly 94,000.

In mid 1956 the Federal Power Commission authorized Panhandle Eastern Pipe Line Co., the company's supplier from the States, to increase its deliveries to 15.5 billion cu ft annually. The major long-term supply to which the company is looking, however, is delivery of Alberta gas through the Trans-Canada pipeline. A 20-year contract has been signed with Trans-Canada for a maximum of 64 billion cu ft in the 13th year after service is started. It is planned to cease purchases from the U. S. when Alberta gas is available.

As of mid-1956 the company served a total of 93,657 customers, including 84,250 residential, 8814 commercial and 593 industrial. With its executive offices located in Chatham, the company's operations are divided into four areas: the Windsor district with 36,841 customers, London with 22,711 customers, the Chatham district with 21,032 customers, and the Sarnia district with 13,073 customers. Altogether the company serves customers in 68 municipalities. The company's city distribution lines total 964 miles, plus an additional 194 miles of rural distribution system.

Union Gas is an outstanding example of a fully integrated company with extensive production, transmission and storage facilities as well as retail distribution. In the past 10 years alone the company has spent $4 million in the exploration for and development of natural gas production in its own area. At the present time the company operates over 300 of its own producing gas wells. During 1956 over 1.3 billion cu ft of gas was produced in company-owned fields. A total of 31 wells were drilled by the company from mid-1955 to mid-1956.

The company is fortunate to have extensive underground storage facilities available which are strategically located with respect to its physical distribution system.

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the Cleveland 92 "Baby Digger" digs more trench ... in more places ... at less cost

THAT TREE LAWN is really *narrow* but the compact maneuverable 92 is doing a neat job of digging from driveway to driveway. The operator sets in and lifts out the digging wheel with speed and safety because the 92 gives him full job visibility and fast accurate boom hoist control. Synchronized wheel and conveyor speeds permit precision placement of spoil. No damage to curb, sidewalk or driveways either, thanks to the 92's perfect balance on long, smooth, non-clog crawlers—a real public relations asset.

★ Only 54" wide over crawlers
★ Digs 10" to 20" wide
★ Digs to 5' deep
★ Power-shift conveyor
★ Reversible discharge
★ Digs all soils
★ Digs in any weather
★ Portable, at legal limit speeds

THE CLEVELAND TRENCHER CO.

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Good Everywhere

Canada—Continued

Depleted gas fields in the vicinity of Dawn have a current capacity of around 15 billion cu ft. During the 12-month period ending with March 31, 1956, a total of 4.5 billion cu ft were placed in storage and 4.9 billion cu ft were withdrawn. At the end of this period 6.48 billion cu ft remained in storage.

The Dawn compressor station currently comprises a total of 2500 hp in compressor engines for pumping gas in and out of storage. Because of the pending arrival of new and larger supplies of natural gas from the west, the company is planning an extensive expansion of its Dawn storage facilities. This is a long-range program which may see an increase in the working capacity of the storage to as much as 40 billion cu ft. An addition of 5000 hp in compressor facility is contemplated.

At the present time the company operates 523 miles of gas transmission line, which is used to supply its various distribution systems. Compressor stations are located at Windsor and Port Alma, in addition to Dawn.

Depending upon the availability of steel and the progress of Trans-Canada's project to bring gas from Alberta, the company is planning on construction of a 122-mile, large diameter pipeline from Dawn to near Hamilton this year. The program includes the construction of a new, 8000-hp compressor station at the Hamilton end of the line. Since it is contemplated that the company will receive gas from Trans-Canada at a point near Hamilton, the line will be designed to reverse the flow of gas as required.

It is contemplated that at least $15 million will be spent on transmission and storage facilities to handle the new supplies of gas.

Feeder lines from the new pipeline will permit deliveries of natural gas to Hamilton, Kitchener, Waterloo, Guelph, Stratford and other communities not now served with gas. As such the new large diameter "trunk line" will become the backbone of the company's expanded system.

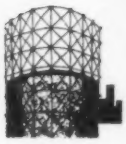
The company's transmission, storage and production resources are solidly backed up by an aggressive sales program that is geared to aggressively merchandise natural gas at the retail level. Union Gas makes extensive use of company appliance show rooms, cooking demonstrations and personal consultation with potential customers. In addition, wide use is made of literature designed to tell the story of natural gas and the Union Gas Co. to new and existing customers. One of the most valuable of these is a small booklet entitled "Facts About Your Gas Company," which is currently in its ninth edition.

Although the extension of gas distribution facilities into new areas was necessarily curtailed during 1956 because of insufficient supplies of gas, the volume of residential sales increased nearly 1 billion cu ft or 12.9% over the previous year. An additional 3973 residential meters were added to the system during the same pe-

More than

2 MILLION FEET OF ½ INCH KRALOY SERVICE PIPE

already installed



Since 1945 more than two million feet of one-half inch Kraloy Plastic Pipe has been installed for natural gas service lines. This one-half inch PVC pipe has done a job superior to that of ¾ inch, and larger pipe, when made of other materials.

One-half inch Kraloy PVC Pipe can also supply more than an adequate volume of natural gas to your customers. Kraloy can do this because of its mirror-smooth interior walls which result in an extremely high C factor.

Other Kraloy advantages:

1. Kraloy is permanent—not subject to electrolysis, rot, rust or scale.
2. Kraloy's flexible strength allows it to be installed faster and easier.
3. Kraloy's lighter weight lets your trucks carry more pipe footage.
4. Kraloy delivers cleaner gas—reducing foreign deposits in jets, valves, etc.

WHEN YOU SPECIFY YOUR NEXT INSTALLATION, DO AS OTHER LEADING GAS COMPANIES DO...SPECIFY KRALOY PVC PLASTIC PIPE!

Representatives:
The Mott Co.—Dallas and Houston
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Call, write or wire for detailed information and specifications.

KRALOY *plastic pipe co., inc.*

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riod. It is estimated that some 5000 additional gas-fired central house heating units were placed in operation. At the present time it is estimated that approximately 45% of all the company's residential customers are using gas for their entire space heating requirements.

The estimated population of the area in which the company currently serves gas is in excess of one-half million. When new supplies of natural gas become available it is expected that between $7 million and $8 million will be spent for the expansion of distribution facilities.

Conversion of Hamilton from its present low-Btu, manufactured gas to natural, which will get under way after the completion of the Dawn-to-Hamilton transmission line, will considerably expand the company's distribution system. The United Gas & Fuel Co., gas distributor in Hamilton, and its associated companies, the United Suburban Gas Co. Ltd. and the Wentworth Gas Co. Ltd., which supply a number of nearby cities, are partially owned subsidiaries of Union Gas. The companies currently have about 40,000 customers using gas in the Hamilton area. Sales were nearly 4 billion cu ft in 1955.

It is contemplated that in the fourth year following the introduction of natural gas in the Hamilton area the companies will have around 60,000 customers. Total meters in service are expected to double by the 10th year. During the first three or four years after the arrival of natural gas the company expects to spend an estimated $8 million on its expansion program.

Hamilton, as the heavy industrial capital of Canada, promises to eventually become Union's largest urban loan. With around 225,000 population, the city exceeds Windsor, the company's next largest urban load, by about 100,000. Together with adjacent cities served by Wentworth Gas and United Suburban Gas, total population of the area is well over 300,000. Natural gas is expected to spark the industrial growth of the entire area.

Among the industries currently

PROTECTO WRAPPED for PERFORMANCE

Assure Complete Protection Against Corrosion with . . . Protecto Wrap COLD APPLIED TAPE . . .

Protecto Wrap TORCH APPLIED TAPE OR . . .

Protecto Wrap FLOOD COATERS*

1 PROTECTO WRAP COLD COATING

The "cigarette wrap" method of coating underground lines has found wide acceptance because of its economy, ease of use and permanence of protection.

2 PROTECTO WRAP TORCH APPLIED TAPE

A superior product which is easily applied to plant piping with the aid of a small pipe rotating device and is readily adaptable to irregular fittings.

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Flood Coaters permit the most effective and economical method of applying hot enamel to field joints. They are applied by hand in the "granny" wrap style, a method accepted, for many years, by most pipeliners.

Your nearest Protecto Wrap Representative will be glad to discuss application and costs with you.

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R. H. HOPKINS, 212 Prudential Building, Pasadena, California
R. R. HUGHES, Box 7065, Richmond Highlands, Seattle, Washington
ROBERT NEE COMPANY, 1527 East 4th Place, Tulsa, Oklahoma
K. J. PEISKER, 114 East St. Charles Road, Lombard, Illinois
UTILITY SPECIALTIES SERVICE CO., Box 4464, Jackson, Mississippi
H. L. SCUDDER, 1607 Jefferson, Houston, Texas
STUART STEEL PROTECTION CO., P. O. Box 347, Plainfield, New Jersey

PROTECTO WRAP COMPANY
2255 SOUTH DELAWARE STREET
DENVER, COLORADO

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Other U. S. Pats. Pending

established in Hamilton are the Steel Co. of Canada, the dominion's largest; National Steel Car Co., a manufacturer of railway cars; International Harvester, and several ceramic and hardware manufacturers.

Ranking close to Hamilton in industrial development is Windsor with its large automobile plants. Ford Motor Co. already has a large manufacturing facility in Windsor and Chrysler is in the midst of an extensive expansion program. It is expected that the new St. Lawrence river waterway will have a marked influence on the growth of Windsor as well as the entire area served by Union.

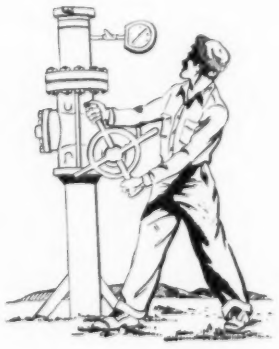
Union Gas . . . Hamilton is the heavy industrial capital of Canada

London, the company's second largest distribution area, is the center of the food processing industry of agricultural Ontario. Natural gas is used extensively in these industries because of its cleanliness.

Ranking third among the cities served by Union is Sarnia, the petrochemical capital of the area, where natural gas is currently finding widespread use in the processing of a wide variety of chemical materials ranging from rubber to plastics and carbon black. Industrial expansion projects under way or proposed in the Sarnia area include a synthetic rubber plant by the Polymer Corp., and a new manufacturing facility to be built by Dow Chemical Co. Dow is expanding ethylene capacity to take care of planned expansion in ethylene glycol and other ethylene products. Plans are also being considered for construction of a new unit to process Styrofoam.

The Du Pont Co. of Canada is also reported to be planning a multi-million dollar petrochemical plant in Sarnia's spreading chemical valley. The plant is to be a producer of polyethylene, sales of which have expanded at an annual rate between 35% and 40% in Canada during recent months. Decision to establish the plant in the Sarnia area was based on the desire to be close to Imperial Oil Company's new $25-million petrochemical plant, a major supplier of ethylene.

Rounding out Union's diversified service area is Chatham, company headquarters, which is the center of a rich Ontario peninsula agricultural region. Chatham also has some light industry which serves as feeder plants to the larger automotive plants in the Windsor area. ■



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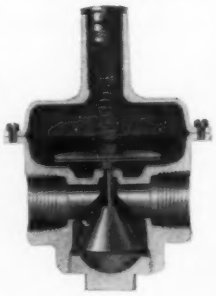
If you're "pinching the pennies" and would like to "pinch the pipe size" on your manifold designs, investigate "Straight-Thru-Flow." Gas flow direction is not changed or reversed in the regulator. Less pressure drop in the regulator allows greater freedom from manifold design. You can often use smaller diameter pipe, thus reducing the size and cost of valves and other manifold components. Write Maxine and find out how YOU can realize savings that more than cover the cost of the regulator.



MAXITROL COMPANY

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DETROIT 39, MICH.

GAS people

O. P. Reed
PSCo. of Colorado

Paul Brookover
PSCo. of Colorado

O. P. REED has been promoted to manager of employee relations for Public Service Co. of Colorado, Denver. PAUL E. BROOKOVER, division commercial superintendent for Public Service, succeeds him as vice president and general manager of Cheyenne (Wyo.) Light, Fuel & Power Co. The appointments were made following the death of F. L. WITSELL, one of the company's executives.

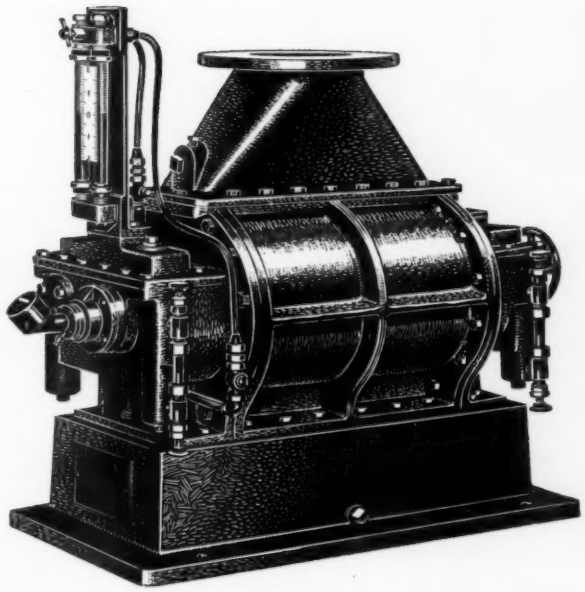
JAMES H. SMITH has been appointed utilization engineer for Lone Star Gas Co.'s west Texas region of distribution. He succeeds H. V. RANKIN.

Siegler Corp., Chicago and Pasadena, Calif., has named PAUL S. HAMMOND vice president and treasurer of the General Water Heater Corp. division. He will continue to serve as vice president of the Holly Manufacturing Co. division. TED CANDEE has been made vice president in charge of manufacturing for Holly and General, and ROBERT GROSSMAN, sales manager of Holly, is now vice president and general sales manager for that company.

PHIL DIGILIO has been named production manager of Beals Advertising Co., Oklahoma City.

JAMES L. SHEEHY is the new district manager of the western area recently established by Tube Turns Plastics Inc., Louisville, Ky. He will make his headquarters in San Francisco.

Roots-Connersville Blower division of Dresser Industries Inc. has promoted GLENN H. CROCKER from chief application engineering, centrifugal equipment, to manager, factory sales. He assumes responsibilities for all sales application engineering



R-C rotary positive displacement meters retain "cash register" accuracy

For utility metering or proportioning of process gas, Roots-Connersville rotary gas meters assure permanent accuracy unmatched by any other design.

- 15:1 accurate operating range.
- Accuracy is not affected by variations in specific gravity, rate of flow, pulsations or impurities.
- Precision machined measuring chambers insure maintenance-free accuracy.
- No valves, diaphragms or other small parts are used, eliminating leakage due to wear.

R-C meters will meet your most exacting requirements in capacities from 2,000 to 1,000,000 cfh. Write for Bulletin M-152 for complete specification details.

Engineers—unusual career opportunities await you at Roots-Connersville. Address your resume to Professional Employment Manager.

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.
457 Oregon Ave., Connersville, Indiana. In Canada — 629 Adelaide St., W., Toronto, Ont.

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.
Division of GREENLEE BROS. & CO.
1944 Columbia Avenue, Rockford, Ill.

people • *Continued*

functions at the Connersville, Ind. headquarters. JOSEPH L. HYLTON has been promoted to the newly created post of manager, market research. He previously held the position of assistant to the sales manager.

In a series of sales department management changes, C. T. DIERKER has been named general staff supervisor, commercial and industrial sales for the Southern California Gas Co., Los Angeles. In other moves, C. R. RIKEL will fill Mr. Dierker's former post as central division sales manager and E. J. HUNTER will take over Mr. Rikel's responsibilities as supervisor of building industry sales. He was formerly division sales supervisor in the company's southern operating division. Mr. Dierker replaces R. D. MAC MAHON, who has left the company.

Royston Laboratories Inc., Blawnox, Pa., has appointed HARRISON M. LOVE JR. as representative in the southeastern states, assisting the Atlanta regional sales manager, E. M. Steinmann. Mr. Love is handling Roskote mastics and other Royston pipeline products as well as industrial protective coatings.

LOWELL L. ELDER and ROBERT S. RYAN have been promoted from senior engineers to assistant supervisory engineers of Columbia Gas System Service Corp., New York. They will report to William C. Day, manager of the gas engineering department in Columbus, Ohio.

HARRY LANGE has been made manager of the southern sales department of the American Cast Iron Pipe Co., Birmingham, Ala. He succeeds TOM M. STARNES, who has retired after 45 years of service. Mr. Lange has been with American 17 years, the last three years of which he served as assistant southern sales manager. HOWARD SISSON succeeds Mr. Lange as assistant southern sales manager.

EUGENE D. ROUSE and JACK S. COLDREN have been named sales representatives for the Garland, Texas and Fullerton, Calif. sales districts of American Meter Co. They have just completed a 6-month company training school in Erie, Pa.

GEORGE W. HAIGHT has been appointed general markets sales representative for Dresser Manufacturing division, Dresser Industries Inc., Bradford, Pa. He will cover 12 states in the Northeast, with headquarters in New York City.

JOSEPH R. RENSCH has been appointed assistant counsel of Southern Counties Gas Co., Los Angeles. Mr. Rensch, an engineer as well as an attorney, was superintendent, production control department, Dow Chemical Co., prior to his new position. He also was formerly with Coast Counties Gas Co.

Expansion of sales department activities of Northern Illinois Gas Co., Bellwood, Ill., has resulted in the following appointments: S. L. ERICSON, dealer sales manager; ROBERT LIDICKER, commercial sales manager; CHARLES PULSE, employee prospect sales activity manager; HARRY C. SCHNEIDER, new building sales manager; MISS KAREN MORSCH, home service counselor.

PRISCILLA EMERY has joined the staff of the Honolulu Gas Co. as home planning consultant. She will assist homemakers in planning or remodeling their kitchens and work areas.

JOHN A. ROBERTSHAW JR. has been elected vice president of Robertshaw-Fulton Controls Co. Mr. Robertshaw, a grandson of one

C. T. Dierker
SoCal

C. R. Rikel
SoCal

H. M. Love, Jr.
Royston

Harry Lange
American Cast Iron

CORRECTION

In the February issue of GAS, on page 87, we ran an announcement about James B. Cook Jr. of Hays Manufacturing Co. Mr. Cook had just become sales manager for Hays. The story said Mr. Cook would be headquartered in Pittsburgh. This was in error. He will, of course, be headquartered in Erie, Pa., home of Hays Manufacturing.

of the founders of the company, has been in charge of foreign operations since 1952. He was made an assistant vice president in 1954.

EDWIN C. HIRSCHOFF has joined United Petroleum Gas Co., Minneapolis as advertising manager for the firm's wholesale, retail and manufacturing divisions.

J. H. WILLIAMS has resigned as general advertising manager of Sangamo Electric Co., Springfield, Ill. T. N. TEIGEN has been appointed manager of the advertising department.

HERBERT PARKER, sales engineer in the Atlanta, Ga. district office of Rockwell Manufacturing Co.'s meter and valve division, has been promoted to Atlanta district manager. Mr. Parker joined Rockwell in 1937 in the Houston office.

GERDES W. RICE has been appointed director of purchases and materials for Lone Star Gas Co. and its wholly owned subsidiary, Lone Star Producing Co. He succeeds BEN R. NEWBERY, who has retired after almost 42 years of service with the Dallas company.

WALTER F. ROCKWELL and WOODFORD D. MILLER are new members of the board of directors of Robertshaw-Fulton Controls Co. Mr. Rockwell was formerly chairman of the

Gerdes Rice
Lone Star

John Robertshaw, Jr.
Robertshaw

Sell Satisfaction
Sell PEERLESS
and
"Keep" the Profits!

Why take Quality for granted . . . why jeopardize your reputation and profits on brands of questionable ability to stay sold? . . . Call-backs, service calls, complaints and dissatisfied customers rob profits and reputation.

Peerless has New Styling that appeals to all . . . that clinches the sale . . . with engineered perfection that provides the heating performance you'll want to sell.

Only Peerless has exclusive Directional Louvers that provide best circulation and keep walls clean. This is only one of the many desirable features that sell Peerless . . . and keep it sold.

Made to Sell
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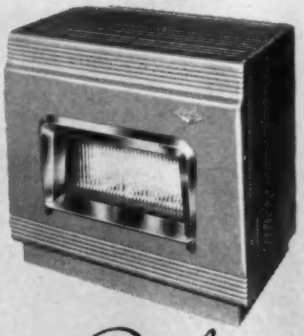
Made to Satisfy



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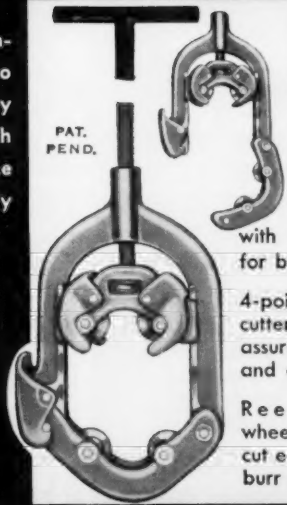
ONLY PEERLESS OFFERS MORE EXCLUSIVE FEATURES THAT MAKE SELLING EASY

SELL THE HEATERS MOST FREQUENTLY ASKED FOR BY NAME.

Peerless
MANUFACTURING CORP.
Louisville 10, Ky.

IF YOU CUT LARGE DIAMETER PIPE...
YOU NEED THESE
New REED HINGED 4-WHEEL **PIPE CUTTERS**
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

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seal against
gas leaks!

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the Concentrated fuel

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LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA

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2016 Leslie Ave., Cincinnati 12, Ohio

people • *Continued*

board of Acro Manufacturing Co., Columbus, acquired by Robertshaw recently. Mr. Miller is an executive vice president of Robertshaw. They will fill board vacancies left by the resignations of CHAUNCEY N. MYNDERSE and CLARENCE W. ROBERTSHAW.

Elton Sellers
Rockwell

W. T. Gettig
Rockwell

W. THOMAS GETTIG, general manager of Rockwell Manufacturing Co.'s Barberton, Ohio valve plant, has been named assistant to the vice president in charge of the meter and valve division. Mr. Gettig will assist in maintaining liaison between all Rockwell valve plants. He is succeeded in the Barberton assignment by ELTON H. SELLERS, now works manager.

FRED L. BREWER has been named assistant to the director of purchases for the A. O. Smith Corp., Milwaukee.

Deaths

THOMAS S. LEVER, former vice president of the United Gas Improvement Co. and general manager of the Philadelphia (Pa.) Gas Works died recently. He was 68. Mr. Lever devoted more than half a century to the operations of the Philadelphia Gas Works prior to his retirement on Dec. 31, 1955. He began his career with PGW as an office boy. A long-time member of the AGA, Mr. Lever was past president of the Pennsylvania Gas Association.

KURWIN R. BOYES, secretary of the American Gas Association since 1926, died suddenly recently. He was 60. Mr. Boyes joined the AGA in 1923 as assistant to the managing director and three years later was named secretary. For a number of years he served as secretary of the personnel and rate committees. He also was in charge of membership. In addition, he served as convention manager and directed the AGA library.

GAS associations

SGA planning 49th annual convention

The Southern Gas Association holds its 49th annual convention in New Orleans, April 29-May 1.

Holding center spotlight for the gathering will be Miss Julia Meade, who appears weekly on CBS television's "Playhouse 90." She will be the honored guest at the annual home service luncheon on April 29, and will discuss "selling on TV" at a convention session on the same day.

Early registrations indicate another record-breaking year for the SGA, with more than 2000 expected to attend.

The list of speakers is headed by Keith Funston, president of the New York Stock Exchange. Gas industry leaders on the program include C. H. Zachry, head of AGA, and Julius Klein, GAMA's president.

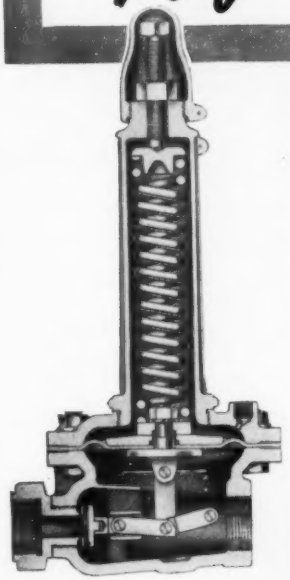
Houston hosts distribution meeting

Houston will be host to a large gathering of gasmen this month when the AGA distribution conference convenes at the Rice Hotel on April 8.

Four days will be devoted to the conference sponsored by the corrosion, customer service, distribution and automotive and mobile equipment committees of the AGA. The transportation committee of the Edison Electric Institute joins with the AGA's automotive equipment committee on this occasion.

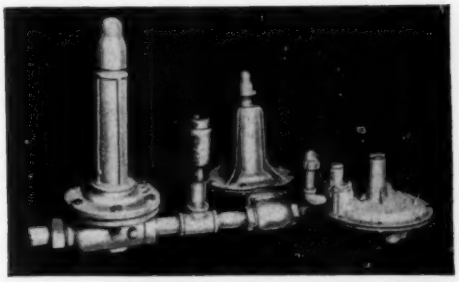
There will be three general sessions on the first three mornings of the conference. E. F. Trunk, chairman of the distribution committee, will preside at the opening session. Following messages from the AGA, the Southern Gas Association, and

IN THE HIGH PRESSURE FIELD
THERE IS SAFETY
IN *Reynolds*...



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.
GAS CONTROL SINCE 1892

1897 1957

PIPE STOPPERS OF ALL KINDS

SAFETY GAS MAIN STOPPER CO. INC.

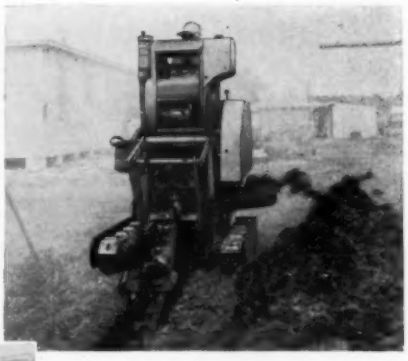
GOODMAN
USED SINCE 1897
2" HANDLE & LOCKING SLEEVE
GAS MAIN STOPPER

523 Atlantic Avenue
Brooklyn 17, N. Y.
Cable Address GASTOPPER, N. Y.

"OVER 2500 FEET OF LOW COST DITCHING IN LESS THAN 5 HOURS"

"I use my 4T Pow-R-Ditcher for foundation cuttings and footings. Also install water lines. Used it to cut 2500 feet of ditch in less than 5 hours for Phillips Oil Co. It is small, rugged, very maneuverable and does a superior digging job even in sticky gumbo soil. Very easy to transport from one job to another in a pick-up truck."

C. C. Bost
BOST DITCHING SERVICE
Friendswood, Texas



ONLY 48" WIDE, 6' HIGH, 13' LONG

An ideal machine for laying gas pipe, service lines and digging home foundation footings. Digs 6" to 14" wide and down to 4½' deep. Thousands in use. Same size moving parts as larger Pow-R-Ditcher Models. Write for complete information on the complete Pow-R-Ditcher line.

Some Sales Distributor Territory Available!

VERMEER MFG. CO., Pella, Iowa

ANCHOR'S BUTANE & PROPANE STAND-BY PLANT PACKAGE

ENGINEERING, INSTALLATION

Anchor's Engineering Dept. will design and supervise plant construction.

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Anchor's experienced staff will assist with the financial details..

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Huge tank car fleet, many plants and vast underground storage assure adequate supplies.

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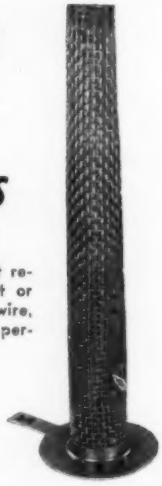
SANDUSKY MAC-IRON OHIO
ESTABLISHED 1901

IN-LINE STRAINERS
TO ORDER



Strainers to your exact requirements . . . basket or conical . . . woven wire, single and duplex, or perforated plate.

All types available in carbon steel, Monel, and stainless.

Specialists to the Petro-Chemical Engineering and associated fields, the Mac-Iron operation is based on scope, quality, and service. Also manufacturers of stock and specification blinds, spacer rings, permanent and temporary strainers, filters, and pivot flanges.

Write today for complete information and literature.

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associations • *Continued*

presentation of awards, G. F. Watters, Niagara Mohawk Power Corp., will speak on the transportation organization.

Tuesday's general session, presided over by H. S. Blanding, chairman of the customer service committee, will feature talks on design of safe gas vents and the use of photography in a gas distribution department.

The last general session, presided over by O. W. Wade, chairman of the corrosion committee, will offer a wide range of subjects—quality control for meter shops, thermoplastic materials for pipe, vapor phase corrosion inhibition, and factors to consider in selecting customer service vehicles.

There will be customer service luncheon sessions on Tuesday and Wednesday and six sessions on automotive and mobile equipment are on the program. From two to three sessions are slated on construction and maintenance, metering, corrosion, and distribution design and development.

Corrosion study set for West Virginia University

The second annual Appalachian underground corrosion short course will be held at West Virginia University, Morgantown, on June 4-6.

Frank Costanzo, corrosion engineer for the Manufacturers Light & Heat Co. and general committee chairman, made the announcement following completion of the plans for this course in pipeline and other subsurface metallic corrosion control.

Mr. Costanzo said he expects a larger attendance than the more than 400 who took advantage of the first course held last June.

Industrial gasmen meet in New Orleans this month

The 1957 AGA sales conference on industrial and commercial gas is slated for New Orleans on April 16-18 at the Jung Hotel.

According to J. Robert Delaney, section chairman, the conference will follow the usual pattern: Commercial gas day will be Tuesday, April 16; a general session is scheduled for Wednesday; and industrial gas day will close the conference on Thursday. The session will be highlighted by inspirational sales addresses and panel selling talks. It will be a forum for the discussion of new and expanding industrial

and commercial gas applications and modern gas equipment.

The Southern Gas Association is serving as co-sponsor of this year's conference.

Pipeline PR committee organized by AGA

An 11-man pipeline public relations committee has been formed by the AGA to help further strengthen gas industry teamwork under the PAR plan. Earle A. Clark, director of PR at Northern Natural Gas Co., has been named chairman of the group.

Committee members are: George W. Anders, Texas Gas Transmission Corp.; Robert J. Fitzpatrick, Texas Eastern Transmission; Ken B. Harper, Transcontinental Gas Pipe Line Corp.; Mortimer H. Jordan, Southern Natural; R. H. Lewis, Natural Gas Pipeline Co.; Fred H. McIntire, American Louisiana Pipe Line; Tom McLaughlin, Colorado Interstate Gas; Austin Stevens, Panhandle Eastern Pipe Line; Burton F. Wiand, Cities Service Gas Co.; and B. Marshall Willis, El Paso Natural.

Weber and Hampel promoted at AGA labs

Earl J. Weber and Thomas E. Hampel have been promoted to assistant chief research engineers at the AGA Laboratories.

Mr. Weber joined the laboratories in 1937 and was assigned to the research section. His first duties were to develop the mathematical aspects of burner design. He has since become a recognized authority in this field and is the author of many bulletins and reports on the subject of burner design.

Mr. Hampel has done much research and development work on commercial cooking appliances and industrial gas equipment. He is the author of a number of laboratories bulletins and reports dealing with industrial and commercial gas research.

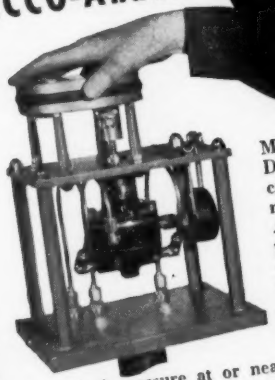
AGA names Harold Walker association secretary

Harold S. Walker Jr. has been appointed secretary of the American Gas Association, succeeding Kurwin R. Boyes, who died recently.

A West Point graduate, Mr. Walker served with the U. S. Army from 1943 to September 1954, when he resigned with the rank of major. For the past two years he has been

ARCCO

ARCCO-Anubis CONTINUOUS GAS SAMPLER



MEETING THE DEMAND for more accurate gas sampling, this newly perfected ARCCO-Anubis instrument replaces inadequate, inaccurate spot sampling methods. The Model 100-7 will over a period of seven days accumulate at a constant rate a sample of gas to a final pressure at or near 100 psig from a sample source, the minimum pressure of which is not less than 125 psig.

The ARCCO-Anubis design is based on the principle that maintenance of a constant rate of increase in gas pressure within a closed container, from zero to any selected maximum pressure, will result in a continuous rate of flow of gas into the closed container.

This is accomplished by means of a specially designed regulation system equipped with a precision drive mechanism so as to obtain a constant predetermined rate of increase in the outlet pressure into the sample container.

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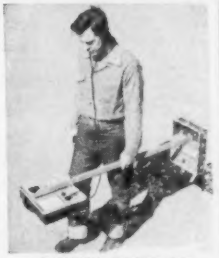

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with indestructible Fiberglas cabinets.

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NEW ENGLAND FORESTRY SERVICE
the complete Gas Leak Location and Mitigation Survey Program
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Heat and vibration-proof, non-solvent, will not shrink, crack or crumble. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion, joint seizure.

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rusted bolts, nuts, screws, 'frozen' parts
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RADIATOR SPECIALTY CO.
Charlotte, North Carolina
SOLDER SEAL

associations • *Continued*

Harold Walker

Vaughan O'Brien

secretary of the AGA general management section.

Vaughan O'Brien, formerly editor of the *AGA Monthly*, has succeeded Mr. Walker as secretary of the management section.

Gas technology courses offered in North Carolina

Two short courses in gas technology have been scheduled for this summer at North Carolina State College extension division, according to Edward W. Ruggles, director of the extension division.

The four-week courses will be held June 3-June 28 and July 8-Aug. 2. Conducted by the department of chemical engineering and the extension division, the classes will be held in the classrooms and labs of the School of Engineering on the college campus in Raleigh.

Twenty-eight major topics in the natural, manufactured, and liquefied petroleum gas industries will be covered. Among the subjects will be gaseous fuels and general behavior of gases, heat and temperature, gas properties, compressed gases, safety practices, house piping and installation methods, regulators, metering, controls, pilots, venting, and many more.

Tuition fee for the course is $100, including all text and laboratory materials required for completion of the course.

GAMA adds members to four divisions

Addition of one member to each of four GAMA division has been announced.

New members are the Boston Stove Foundry Co., Reading, Mass., ranges; Altorfer Bros. Co., East Peoria, Ill., clothes dryers; and North Coast Manufacturing Corp., Portland, Ore., furnaces.

The industrial division of Minneapolis-Honeywell Regulator Co., headquartered at Philadelphia, has

joined the industrial division. This is in addition to the company's membership in the controls division.

Florida and Georgia gasmen meeting in Miami

The annual convention and general management conference of the Florida - Georgia Gas Association will be held April 12-13 at the Key Biscayne Hotel in Miami, Fla.

Joseph Frink of Florida Power & Light Co., Miami, is serving as general chairman for this meeting.

Christy Payne heads Pennsylvania gasmen

Christy Payne Jr., vice president of the Peoples Natural Gas Co., Pittsburgh, has been elected president of the Pennsylvania Natural Gas Men's Association. He succeeds Fred W. Batten, who is vice president of the Columbia Gas Service Corp., New York.

Other officers are J. G. Montgomery Jr., president of United Natural Gas Co., Oil City, Pa., vice president; and P. L. Kesel, Carnegie Natural Gas Co., Pittsburgh, who was reelected secretary-treasurer of the group.

Staff promotions announced by AGA

The American Gas Association has named Hayes S. Walter, for the past five years commercial cooking representative in the industrial and commercial gas section, as commercial promotion manager in its PAR program.

Gerald P. Mullins, last with Lennen & Newell Inc., has been named assistant to PAR promotion manager, Charles R. Bowen.

AGA has also named Raymond J. Fitzgerald auditor. For the past four years he served on the staff of the association's bureau of statistics and was a statistician for the American Transit Association before that.

GAS association notes

The gas equipment manufacturers committee of GAMA has elected C. B. Dushane, American Meter Co., as chairman. Other officers are: K. R. D. Wolfe, Fisher Governor Co., vice chairman; G. T. Bowman, Rockwell Manufacturing Co.; C. H. Abbott, Sprague Meter Co.; and Carl N. Brown, U. S. Pipe & Foundry Co., operating committee members.

Charles M. Sturkey, president of Washington Natural Gas Co., Seattle, has been reelected president of the Association of Washington Gas Utilities. New vice presidents are C. Spencer Clark, president of Cascade Natural Gas Corp., Seattle, and Nathan H. Gellert Jr., president of Spokane Natural Gas Co. Leland E. Jones, vice president and southern division manager of Washington Natural, Tacoma, was reelected secretary-treasurer.

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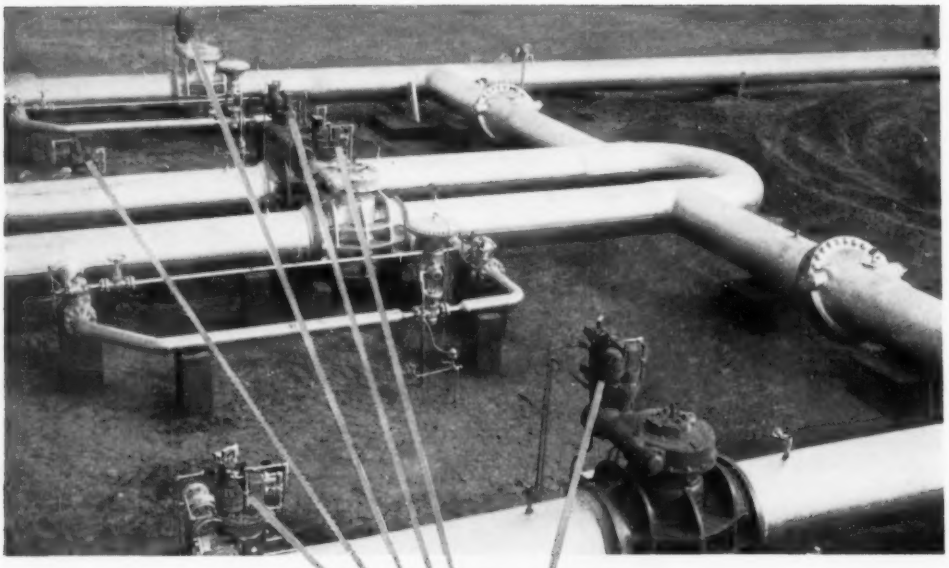

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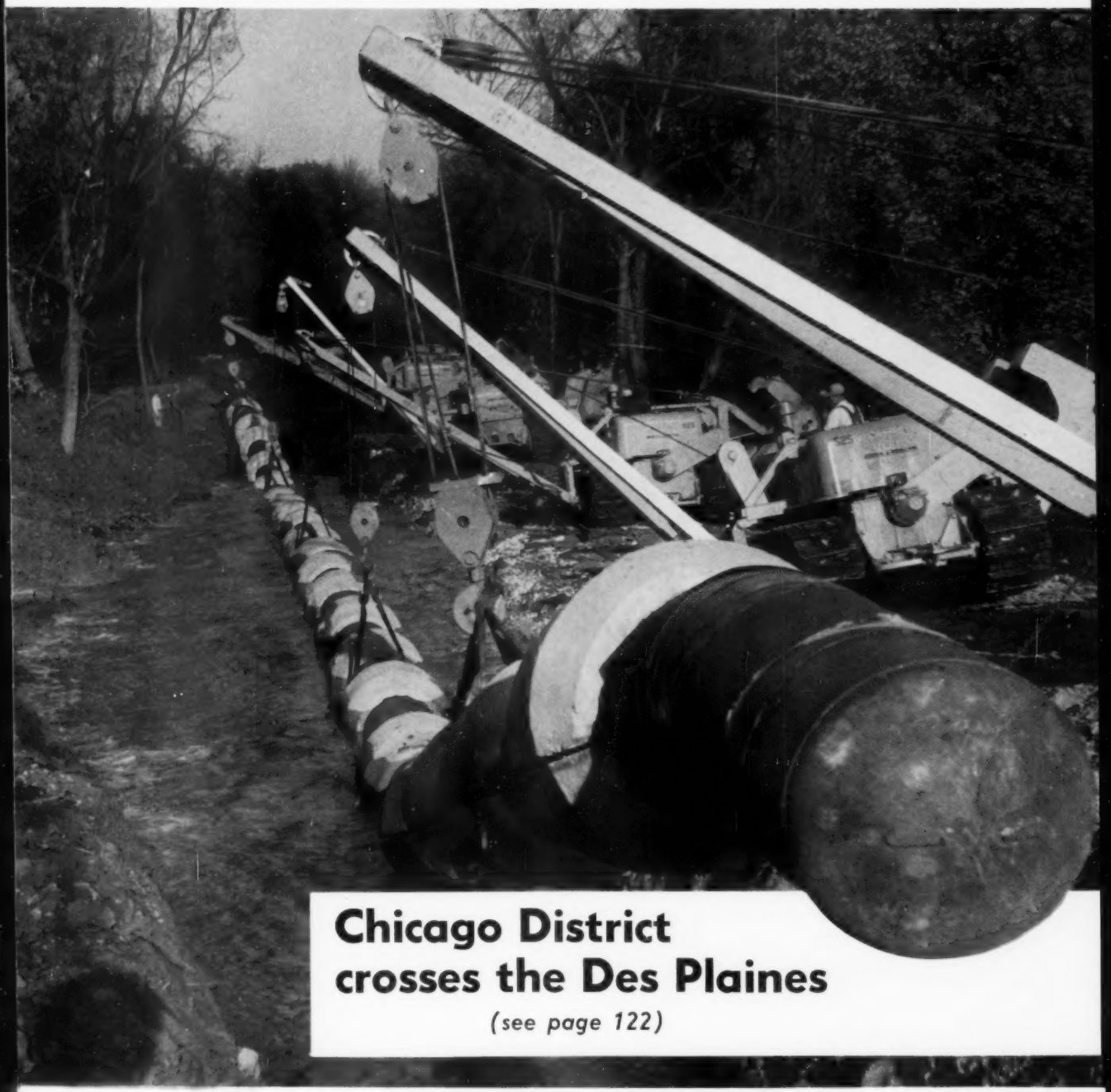

Chicago District crosses the Des Plaines

(see page 122)

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YOU CAN DEPEND ON DOW

Some observations on stresses in large-diameter pipelines

By G. M. McCLURE, Assistant Chief
Applied Mechanics Division
Battelle Memorial Institute
Columbus, Ohio

DURING the past decade, the state of knowledge of pipeline design has advanced significantly. Along with this advancement, there has developed an increasing interest in some of the "secondary" loads and resulting stresses that can exist in a line.

Let a secondary stress be defined as any stress in the line other than the *nominal* values produced by internal pressure. This is a broader definition than usually used since it does not restrict the *extent* of the stress. Stresses at very localized points are included, in addition to stresses acting over large areas.

A convenient way to define the extent of a stress was suggested by Kuhn[1] in a paper given in January 1956 at the International Conference on Fatigue in Aircraft Structures. His classification was specifically applied to aircraft structures; however, it offers a very convenient method for defining the problem of secondary stresses in pipelines. He defined four types of stresses according to the length over which the stress acts. The four types are called: "fathom" stresses,

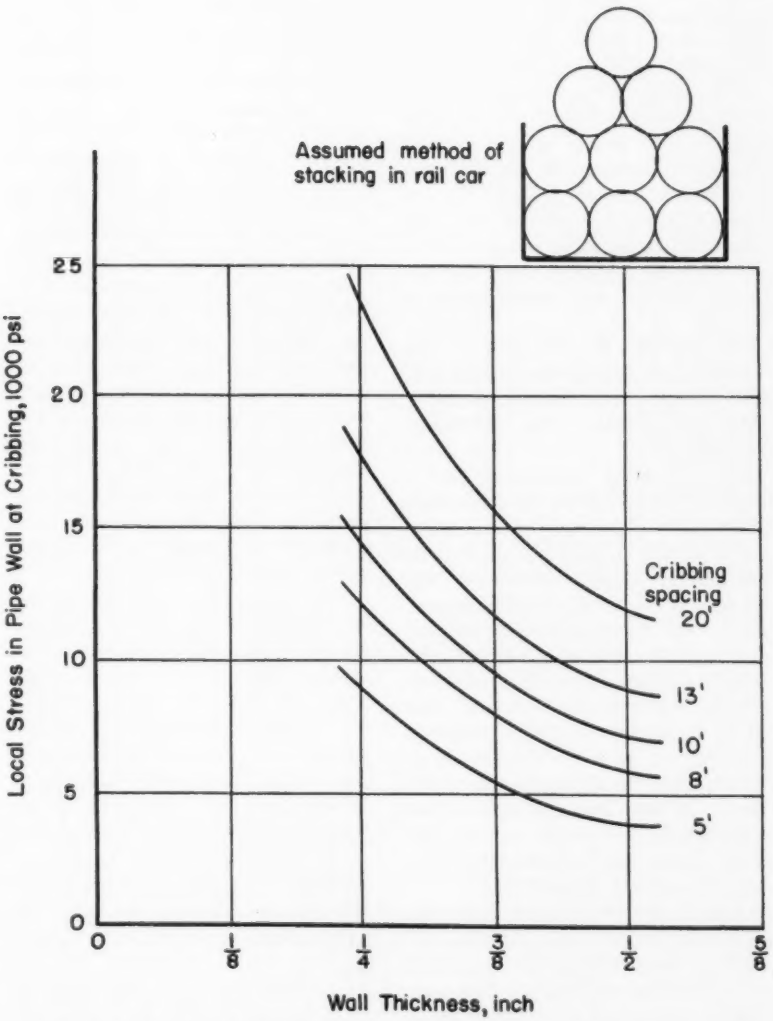

Fig. 1. Local stresses in pipe stacked on cribbing for various wall thicknesses and cribbing spacing.

"foot" stresses, "inch" stresses, and "millimeter" stresses.

Fathom stresses are essentially constant for a length of about 6 ft. and can ordinarily be calculated with good accuracy from ordinary engineering formulas. (This is not always possible in a pipeline or other buried structure, however, because the loads and restraints are not always known, especially when soil loads are involved.) The fathom was chosen because it is the only unit falling in the desired range. Foot stresses exist over lengths on the order of a foot and can also be calculated in most cases by known but slightly more refined engineering formulas. Inch stresses such as occur in a generous fillet must usually either be estimated or measured. Millimeter stresses are those which exist, for example, at the root of a sharp notch or around a small rivet hole, and can only be estimated since they cannot be measured by ordinary methods. In what follows, this rather unique method of classifying stresses will be used in considering the relative importance of secondary stresses in pipelines and in pointing out how such stresses can be taken into account in the design and operation of a line.

Let us now review some of the more prominent sources of secondary stresses in pipelines starting with the time that the pipe leaves the mill.

One possible source of rather high stresses that is sometimes overlooked can occur during shipment of the pipe from the mill to the job site. Let us assume we are dealing with a case of rail shipment where the pipe is stacked several layers high on a railroad car—the height of the stack depending on the pipe diameter. Normally, the stack is set on cribbing laid across the floor of the car—2-in. x 6-in. or 2-in. x 8-in. lumber is commonly used. If the spacing between the cribbing is too large, quite high local stresses can occur in the pipe wall adjacent to the cribbing.

Fig. 1 shows stresses that can occur in 30-in. diameter pipe of various wall thicknesses for various cribbing spacings. The assumed method of stacking is indicated in the figure. The stresses are localized bending stresses in the wall of the bottom layer of pipe just above the cribbing. They were calculated by a method suggested by Roark.[2] They are static stresses and can be classed as inch stresses.*

During shipment, a certain amount of bouncing of the car occurs and accelerations of 3 g are possible. Thus, alternating stresses on the order of three times those indicated in *Fig. 1* are possible and the space between the cribbing on the bottom should be packed to keep these stresses well below the endurance limit of the steel.

This is rather straightforward case of secondary stresses, but is mentioned here because, in at least one instance in the past, it is known that fatigue cracks (which later caused leaks during test) developed in the pipe wall in shipment.

During construction, a number of things can happen which produce high secondary stresses. Some of these introduce the stress immediately, some produce irregularities which might later lead to high secondary stresses when pressure is introduced in the line, and some involve a combination of both.

Of course, the practice of welding the line together above ground on skids and then lowering it intact into the ditch leads to longitudinal bending stresses that can vary quite widely. These are a function of the weight of the pipe, the load applied by the backfill, and the accuracy with which the contour of the bottom of the ditch matches the "unstressed" contour of the pipe.

One example of this type of secondary stress was obtained in some strain-gauge measurements made by Battelle engineers several years ago during the construction of a 30-in. line. Bonded wire strain gauges were applied to the line at two locations about 85 ft apart while the line was still above ground on skids. *Fig. 2* shows the strain-gauge locations. One ring of gauges was applied on straight pipe and the other in a 6° sag bend. By comparison of readings of the gauges before and after the line was lowered into the ditch and backfilled, it was possible to determine the "residual" longitudinal stresses in the line as installed in the ditch. *Fig. 3* shows the longitudinal stresses left in the line after it had been backfilled. It can be seen that some bending existed at both gauge locations—relatively little in the straight pipe and appreciable in the sag. This example illustrates that, even with careful attention to field bends to make the line conform to the bottom of the ditch, appreciable longitudinal stresses can be produced. Such stresses would be classed as fathom stresses.

Several other possible sources of high secondary stresses originate during construction. One is deformation of the pipe out-of-round such as might occur during handling or in field bends. An example of this is shown later.

Two of the most troublesome sources during construction are the inadvertent production of dents in the pipe wall and the occurrence of cracks in girth welds—from which inch and millimeter stresses, respectively, are produced. Both of these are sometimes hard to detect during inspection. Their significance is also discussed later.

In reviewing secondary stresses during the operational life of a line, it is convenient to classify the stresses that can occur according to the primary load that produces the stress. High stresses result from the action of three basic loads during operation — internal pressure, temperature change, and external loads on the line.

By virtue of the definition chosen for secondary stresses, internal pressure can produce high secondary stresses only in the presence of some sort of irregularity in the pipe. For example, when the pipe is out-of-round, the internal pressure tends to make it become round and, in doing so, produces bending stresses in the wall which are tension in some locations and compression in others. These can normally be classified as foot stresses. Localized out-of-roundness such as dents in the wall can pro-

*In calculating the stresses in Fig. 1, it was necessary to assume the area of contact between the pipe wall and the cribbing. The exact area would vary appreciably with the type of wood used for the cribbing. For this reason, the stresses shown should be considered approximate.

This article is adapted from a paper presented at the convention of the American Society of Civil Engineers pipeline division, Heidelberg Hotel, Jackson, Miss., Feb. 18, 1957.

Pipeline stresses . . . Design methods have improved greatly in the past decade

duce very high bending stresses, usually of the inch type.

At branch connections or other fittings where the cylindrical symmetry of the pipe is interrupted, localized bending stresses can also exist. These are usually of the inch or millimeter type.

Probably the highest secondary stress produced by the action of internal pressure is in defects such as weld cracks. In these cases, only a very small volume of metal is affected and these can be classed as millimeter stresses.

Examples of the magnitudes of some of the secondary stresses resulting from internal pressure are available from experimental work that has been done in the past.

One example is from the results of the strain-gauge measurements made at the sag bend shown in *Fig. 3*. It was found that the pipe was out-of-round in this bend and stresses above the yield occurred when internal pressure was introduced during the hydrostatic test after construction. *Fig 4* shows the stresses determined at two pressures from the strain-gauge readings taken during the test. The approximate cross section, determined from diameter measurements before the test is shown in the center of the plot. Comparison of the cross section and the stress curves furnishes an explanation for the high stresses that occurred at the bottom and sides of the pipe. At these locations the pipe wall had been somewhat flattened (that is, the radius of curvature was greater than 15 in.) and internal pressure tended to make the wall assume a radius of 15 in. again, thus producing high tension stresses on the outer surface where the strain gauges were placed.

Quite a number of investigations have been carried out to determine stresses in reinforced branch connections. One extensive project was completed at Battelle last year for the American Gas Association; the results of this investigation will soon appear in an AGA research report. In this work, three different sizes of branch connections and three different types of reinforcements (pad, the saddle, and the full-encirclement sleeve) were investigated under internal pressure and two different external bending loads applied to the branch pipe. The results of the investigation are too extensive to describe here. However, it was found that with the type of reinforcements that would be fabricated in the field (as opposed to forged tees), stresses on the order of the yield strength of the pipe can occur at operating pressures.

Changes in temperature during the life of the line, of course, produce varying longitudinal stresses. In long, straight sections of buried line these can be easily predicted since the line can be assumed to be completely restrained in the longitudinal direction.

At sharp changes in direction or around branch connections the pipe is not completely restrained by the soil and high bending stresses can result from temperature changes of the line. Usually these stresses cannot be accurately calculated because the restraints on the pipe from the soil are not accuratey known.

Measurements of the long-time variations in longitudinal stress that result from temperature changes are not easily made. This is because the changes take place over a fairly long period of time and it is very hard to maintain stability in a sensitive strain-measuring devise over a period of time. Progress is being made along these lines, however, and quite a few operating companies are now undertaking experimental programs to determine stresses at critical points in their lines. The results should be available within a year or so.

Some of the more prominent external loads that can produce secondary stresses in a pipeline include the weight of the backfill, traffic loads at uncased road crossings, and any earth movement or settlement that occurs.

The backfill loads and traffic loads tend to deform the pipe to an elliptical shape and thus produce bending stresses in the wall.

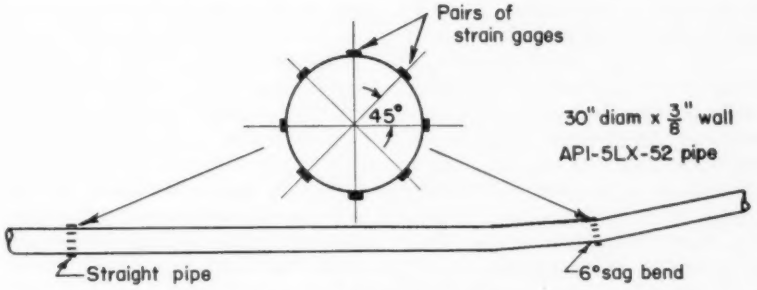

Fig. 2. Strain gauge locations.

Manning and Lodge at Battelle performed some experiments several years ago on buried 20-in.-diameter by 1/4-in. wall pipe to determine the initial backfill stresses and also how they might vary over a period of time.[3] With internal pressure in the pipe at 900 psi, the initial backfill stresses were found to be on the order of 1000 psi. Over a year's time, however, as the backfill settled, the bending stresses produced by the backfill were found to increase and the maximum variation observed was on the order of 1900 psi—about 6 per cent of the nominal pressure stress.

Professor Spangler at Iowa State made an analysis of backfill loads and traffic loads.[4] He showed, for example, that in a 30-in.-diameter x 3/8-in. wall pipe with 3 ft of backfill and 800 psi internal pressure, the initial backfill loads can be as high as 9 per cent of the nominal design hoop stress. The combination of backfill and truck loads

Pipeline stresses . . . Backfill, traffic loads, earth movement can produce stresses

might reach values as much as 20 per cent above nominal design stress.

Stresses resulting from these two external loads can be classed as fathom or foot stresses.

After discussing some of the sources of secondary stresses in pipelines, the logical question is "What do we do to take these into account in the design and operation of a line?" As evidenced by the successful operation of many thousands of miles of lines built in the last 10 years, the pipeline industry now has good methods of doing this. As previously noted, however, the problem of how to treat secondary stresses is a complicated one and very few engineers are willing to state that they know enough about the subject. Continuing effort is needed to define these stresses even more accurately.

In attempting to answer the question above, it would be well to point out the significance of the secondary stresses that have been discussed.

Experience has shown that nearly all leaks or failures in lines originate in some type of stress concentration—where stresses of the inch or millimeter type exist. The more gross foot and fathom stresses have often played a part also. A lot of leaks that occur do so (after a number of years of operation) at a pressure lower than some previous pressure to which the pipe was subjected. One explanation for this is that in the area of the inch or millimeter stress at the leak, a foot or fathom stress appeared or increased during operation. As previously pointed out, secondary stresses from temperature changes and backfill or traffic loads can vary quite widely with time. If they happen to reach an especially high value in an area where an inch or millimeter stress already exists, the total combined stress there might be higher than existed during the original test of the line, and an apparently unexplainable leak could occur.*

Thus, experience has indicated that localized stresses (especially the millimeter type) are of primary significance, and that the fathom stresses, acting over a large area are not detrimental, if acting alone. The basic reasons for this behavior can be explained by different states of stress that exist in the two cases. To illustrate this point, consider two tensile specimens of a medium carbon steel—one unnotched and one containing a sharp notch. The ductility exhibited by each is a function of the relative magnitudes of the normal stresses and the shear stresses in the specimen. The unnotched specimen, of course, represents a uniaxial stress case. That is, the maximum tensile stress exists in one direction only and there is a maximum shear stress equal to one-half of the tensile stress. The ratio of the maximum normal stress to the maximum shear stress is relatively low. This specimen remains quite ductile, even when tested to temperatures as low at −100°F, and finally fails by a shear fracture.[5]

In the notched specimen, however, the sharp notch drastically alters the state of stress in a small volume of metal at the base of the notch. A state of triaxial stress exists there with tension stresses in all three directions. This raises the ratio of maximum normal stress to maximum shear stress and decreases the ductility of the material at that point. The notched specimen when tested below temperatures in the range of 20 - 30°F might exhibit very little ductility and fail by cleavage [5] (the temperature here depends on many factors,

*It is assumed here that corrosion is not a factor.

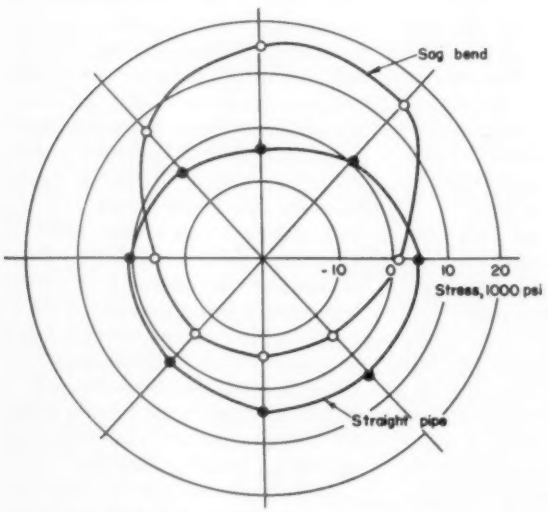

Fig. 3. Longitudinal Stresses produced by lowering-in and backfilling.

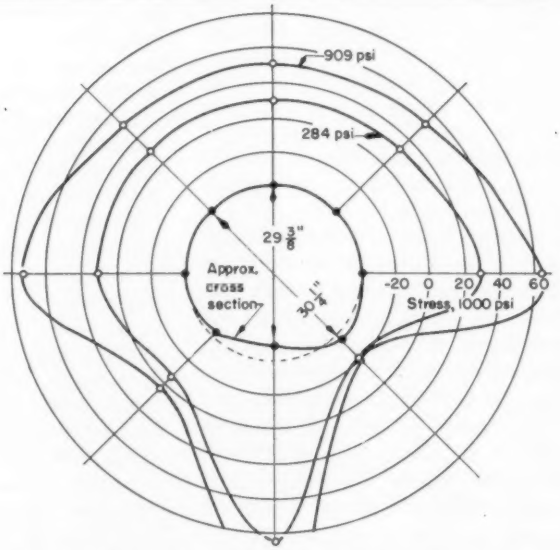

Fig. 4. Circumferential stresses at sag bend during test.

Pipeline stresses . . . Rather high stresses can occur during shipment of pipe

including the chemical composition and previous stress history).

Referring again to secondary stresses in pipelines—the foot and fathom stresses can be likened to the unnotched tensile specimen. The state of stress is such that the pipe material has the ability to yield and in doing so, either relieve or accept the load producing the stress without failure. The millimeter stresses might represent the notched tensile specimen with a higher stress ratio and less inherent ductility.

Of course, the obvious method of insuring a successful pipeline is to eliminate the inch and millimeter stresses and minimize the foot and fathom secondary stresses. (The latter cannot be completely eliminated since some are produced by loads that vary throughout the life of a line.) Careful design is, of course, the first step—where the best available materials and methods can be prescribed in order that potential sources of high secondary stresses are not built into a line. Design methods have improved greatly in the past decade, and as pointed out previously, work is going on in the industry to gain more information on some of the stresses not yet completely defined.

Good construction practices and close inspection during construction are also very important. Here again there has been a lot of advancement in recent years with the manufacture of improved heavy equipment, and the development of improved welding techniques, X-ray, and other inspection methods.

All of these improvements in design and construction have gone a long way toward eliminating potential sources of high secondary stresses. The proof of the pudding, so to speak, is the test after construction. This test is important in two main respects. First, it serves as a test of the tightness of the line, and any leaks that exist can be found and repaired. Second, it provides a means of detecting and removing any sources of high secondary stresses that were missed during inspection or introduced after inspection. To do this effectively, the test must subject the line to stress levels higher than will occur later during operation in order to account for the secondary stresses produced by temperature and external loads which vary during the life of a line. Since we do not have accurate data on the range over which these stresses vary, the best assurance that all of the detrimental inch and millimeter stresses are detected is to use as high a test pressure as is feasible. Testing to pressures producing a nominal circumferential stress equal to the minimum specified yield strength of the pipe, or above, is considered by the author to be desirable (if practical in the field of operations). In doing so, the line is "proved" to a maximum possible per cent above the operating stresses. Such practice would undoubtedly produce yielding at some locations in the line. Yielding is not considered serious, however, except at points where the pipe material has low ductility—such as the millimeter stress points. Any of these points that are severe will show up as leaks during the test and the pipe containing them can then be replaced before the line is put in operation.

To summarize, the following observations and conclusions have been discussed:

(1) Secondary stresses are produced by three basic loads: external forces on the line, temperature changes, and the effect of internal pressure at irregularities. (Corrosion is another possible factor—assumed for the discussions here to be nonexistent, however.)

(2) In general, secondary stresses produced by temperature changes and external loads are more variable throughout the life of a line than those produced by internal pressure.

(3) The localized stresses that exist over lengths of an inch or less are of primary concern in a pipeline (and in other structures) since experience has shown that all leaks or failures are originated at such points.

(4) The secondary stresses that exist over lengths on the order of a foot or greater are apparently not detrimental unless a localized stress is also present. Under such a "large-area" stress, the pipe material can yield and in many cases relieve the secondary stress. This is not true at a localized stress raiser where the material's ability to yield may be limited.

(5) A high test pressure is considered important to insure that none of the localized stresses exist in the line when operation begins. ■

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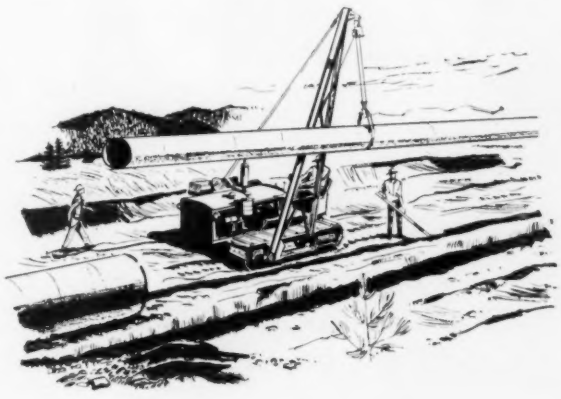


On east bank of the river, the line was welded together (above) and coated, and concrete weights were placed at 11-ft intervals. When submerged, anchors gave pipe a weight of 30 lb a running ft. After weights were in place and bolted together (below), bolt heads were tarred to prevent corrosion.

Chicago District crosses the Des Plaines river

CHICAGO DISTRICT PIPEline Co., Chicago, took advantage of an unusually dry season late last year to make a crossing of the Des Plaines river in suburban Chicago with a 30- and 12-in. bypass pipeline.

These lines will be tied-in with an extension of Chicago District's Howard St. line later this year. For the present, the crossing is unused. The work was done while the waters of the Des Plaines were at an extremely low point.

Company officials expect to put the crossing into operation by Nov. 1. Work on the connecting line will begin May 1.

When the river crossing and connecting lines are put into operation, the delivery capacity of Chicago District's system will be increased a total of 518 MMcf/day. Of this total, 288 MMcf/day will be delivered to Peoples Gas Light & Coke Co., Chicago, the pipeline's parent company. The remainder will be sold to Northern Illinois Gas Co.

Contracting & Materials Co., Evanston, Ill., installed the 1000 ft of 30-in. and 1000 ft of 12-in. OD steel pipe across the Des Plaines. The contractor weighted the pipe with prefabricated concrete weights, made by Allan Edwards Inc., Tulsa. The 30-in. pipe was made by A. O. Smith Co., Orange, Texas.

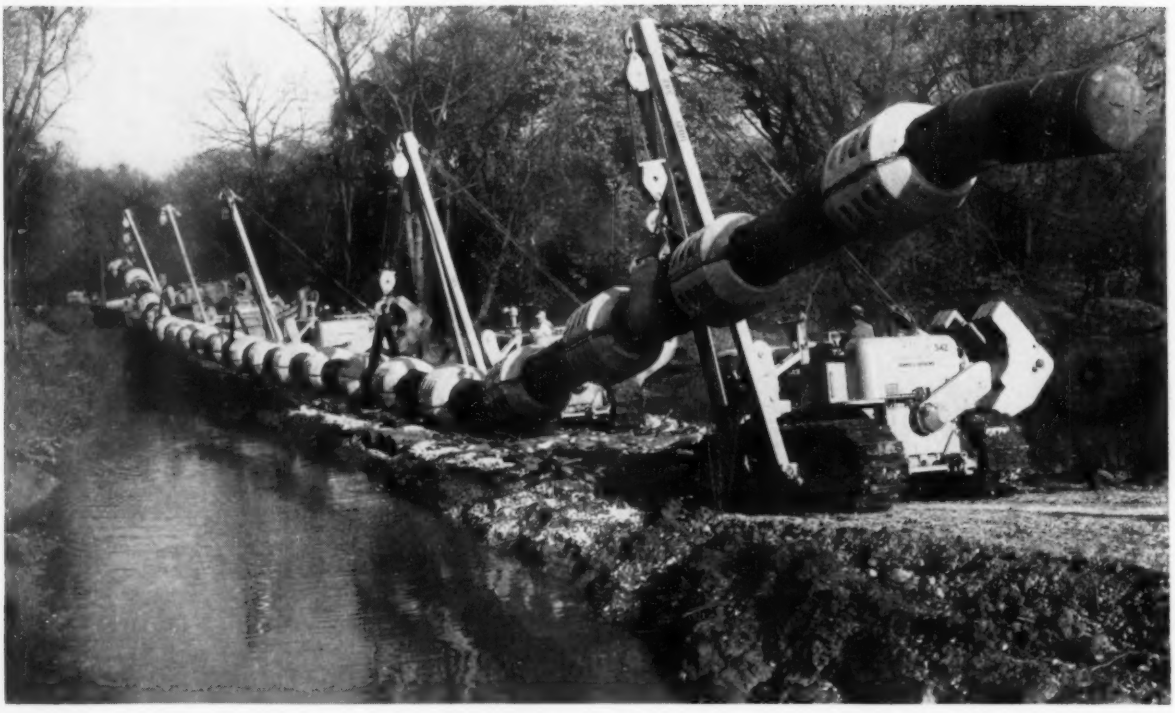
Crossing the Des Plaines river

After the line was weighted and welded together, a fleet of sideboom pipelayers moved in to haul the pipe to the crossing spot.

End of the line is picked up by tractor preparatory to moving pipe to river.

Tractors have moved into position for lowering pipe into Des Plaines river. Five pipelayers were needed for job.

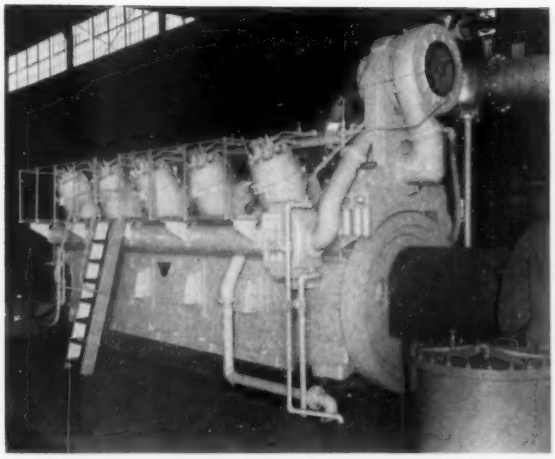
Crossing the Des Plaines river

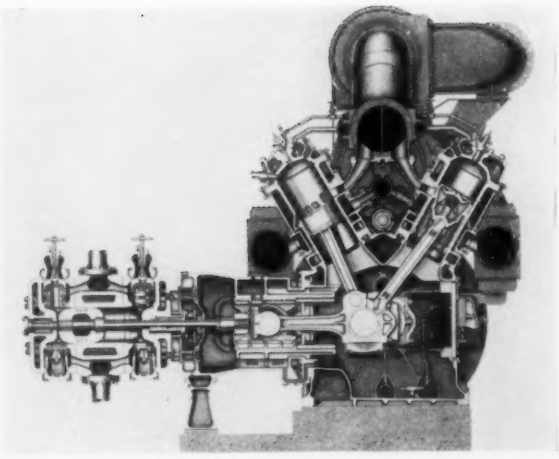


Lowering in operation begins as the five pipelayers work in unison. Crossing was made during fall months, when Des Plaines river was at its lowest point of the year.

Pipe begins to disappear under water as lowering operation continues. Lowering was done from specially built haul road across stream bed.

Lowering operation is finished, except for backfilling. When put into use, crossing will carry 518 MMcf/day to Chicago and suburban areas.





Left: View of crank door side from flywheel end of series turbocharged 10-cylinder engine. At right is a cross section view of series turbocharged 10-cylinder engine.

New series turbocharger demonstrated for editors

By DON WRIGHT
Managing Editor

COOPER-BESSEMER CORP. demonstrated its latest engineering advancement—series turbocharging for two-cycle V-angle engines—for a group of industrial press editors recently at the company's Mount Vernon, Ohio, headquarters.

Ralph L. Boyer, Cooper-Bessemer vice president and chief engineer, explained how series turbocharging operates, and also ventured several opinions on future developments in the field of electric power generation.

Gas will continue to be the most economical and efficient fuel for power generation for many years to come, Mr. Boyer said. He does not see nuclear energy becoming any kind of a factor until at least 1980.

During the next 25 years the steam turbine will be the main source of energy. Steam turbines will continue to be used in larger and larger stations, he said.

The gas turbine will not be able to compete efficiently with the steam turbine for many years, although it does have an important place now in smaller generating stations, he said.

Mr. Boyer also feels that natural gas has no serious competitor as a fuel for use in these power stations. Fuel oil already has become too high priced, and he feels that coal offers no threat at all.

The Cooper-Bessemer official also believes that continuing improvements in turbo charging will be a great help to the gas industry. Turbocharging makes it possible to greatly increase horsepower of an engine without materially adding to size of compressor stations.

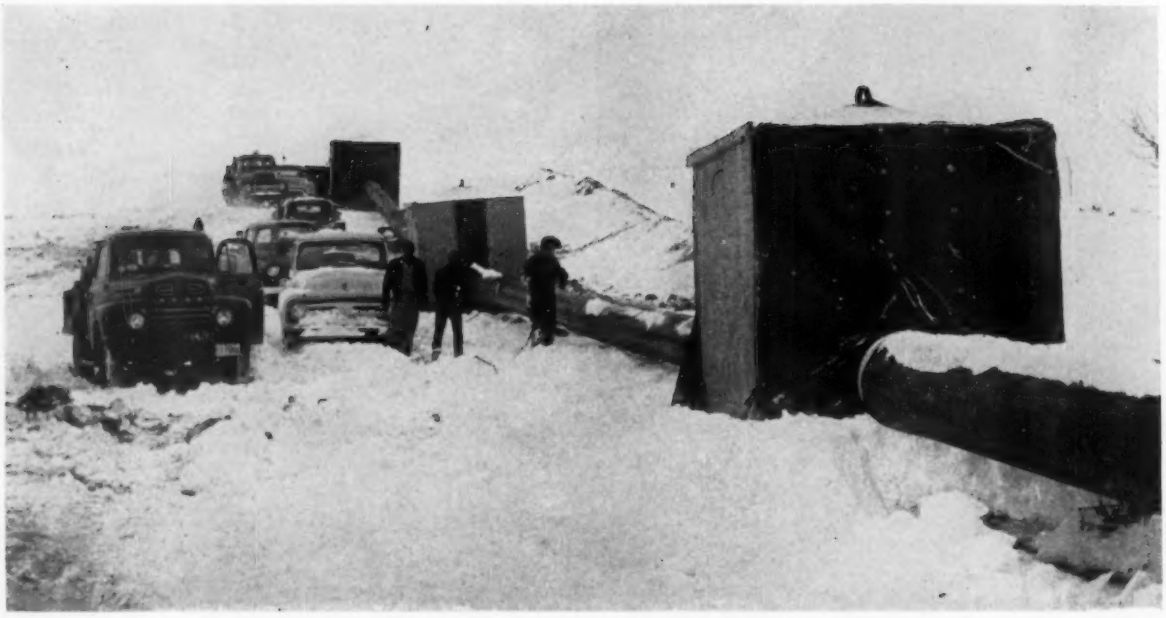
The company's new series turbocharging is claimed to provide almost twice the horsepower in comparison with a similar model made nine years ago. The manufacturer also says the new series turbocharged engine produces 40 per cent more horsepower than its immediate predecessor.

Cooper-Bessemer's series turbocharging works this way: Air for scavenging and combustion is first compressed by either a single exhaust-driven turbocharger or a pair of such turbochargers operating in parallel, depending upon engine size. Following this initial compression, the air is discharged into an engine-driven blower for second stage compression. Delivery is then made to separate aftercoolers, to remove some of the heat of compression, and thus into the air headers serving each bank of power cylinders.

The manufacturers claim that turbocharged compressors can be operated at full efficiency in high altitudes. Another advantage, says the company, comes in an increase in thermal efficiency; fuel consumption as low as 6900 Btu/bhp/hr is now guaranteed.

Two of the new Cooper-Bessemer units have been installed and field tested on pipelines. Panhandle Eastern Pipeline Co. has series turbochargers operating on three engines rated at 1350 hp at its Seward station, while Magnolia Petroleum Co. has one 1800-hp unit in operation at its Pegasus station.

The manufacturer says that series turbocharging increases engine output and improves performance in three ways: (1) By converting an unusually high amount of waste heat to usable power; (2) By resulting in more effective scavenging than ever before; (3) By providing abundant clean air for the combustion cycle.



Welding huts provided shelter for welders to finish their job along Colorado Interstate's Wyoming line despite the bitter cold weather and stiff Wyoming winds. Welders were able to keep on working in winds that got up to 30 miles per hour.

The weather outside is frightful . . .

but 30-mile-an-hour winds don't stop Colorado Interstate welders

WHAT may be the answer to a welder's prayer, especially when a cold wind is whistling around his shoulders, has been dreamed up by Colorado Interstate Gas Co.'s pipeline department.

As with many progressive steps, old Mother Necessity can take a bow as the one who implemented the innovation which for the lack of a more colorful description is simply called a "welder's hut."

The heavy winds which constantly buffet the broad plains of Wyoming were proving more than a little annoying in that they were causing the welders to shut down operations on the Green River-Denver 22-in. transmission line at a rate which was becoming alarming as well as irritating.

To provide the welders with a shelter which could ward off the winds and yet at the same time give the men sufficient room and light in which to operate safely was the problem.

The solution came from Parker Boggs, assistant superintendent of the pipeline department.

He sketched out a rough copy of what he had in mind, received the go-ahead to have the huts manufactured and thereby put welders back into business when otherwise they'd be sitting by idly.

The welder's hut is 8 ft high as well as 8 ft wide on allsides. It is constructed of 1-in. angle iron and 1-in. pipe with plyboard on two sides and heavy fire-proof canvas on the other two sides. In addition, the huts have 18 in. of overlap canvas to take care of the irregularities in the terrain.

The frames for the welders' huts were fabricated in the company's shop at the Devine compressor station. Canvas for the frames was purchased from the Pueblo Tent & Awning Co., where the canvas was fire-proofed before it was laced to a frame.

Rings and harness snaps are used

Construction men fought terrain and bitter cold in the construction of PNW's "scenic-inch" pipeline.

Why communications have to be good on Pacific Northwest's "scenic-inch" line

Pumping gas over mountain passes across 1487 miles of America's toughest terrain requires the most reliable communications available.

Pacific Northwest Pipeline Corp. presented this requirement to the Bell System, with one additional request—economy.

The result is a private line telephone system that PNW's Salt Lake City control center uses to keep a running summary of conditions along the line. Information gathered in Salt Lake City from each compressor station includes dew point, BTU content and specific gravity of the gas. Dispatchers use this data as guidance in controlling flow.

• • •

Bell System communications can work for you as fast and reliably. Just call your Bell Telephone Company business office. A representative will gladly discuss your requirements.

Pacific Northwest's Salt Lake City dispatchers collect data hourly from every compressor station and maintenance point on the company's 1487-mile pipeline.

BELL TELEPHONE SYSTEM

PRIVATE LINE TELEPHONE • PRIVATE LINE TELETYPEWRITER DATA TRANSMISSION SYSTEMS • CHANNELS FOR: REMOTE METERING AND CONTROL • TELEPHOTOGRAPH • CLOSED CIRCUIT TV

to close off the canvas ends of the huts.

During the latter part of December the Company had 24 huts in use on the Wyoming job and Boggs estimated that the welders were able to weld 30 miles through use of these huts where normally they would have been shut down.

"When the wind blows about 12 miles an hour, a welder still is able to work," explained Boggs, "but once that wind gets over 15 miles per hour, as it often does in southern Wyoming, we would have to halt welding operations."

Through use of these huts, the welders have been able to continue operations despite winds up to 30 miles per hour, he added.

The 8 x 8 x 8 dimensions for these particular huts weren't just plucked out of the air.

Boggs explained that since the men were working on 22-in. pipe on the Wyoming line, the 8-ft wide huts gave the welder and his helper each 3 ft of space in which to operate.

The huts were built 8 ft high in order to provide sufficient flexibility for the varied type of terrain faced in Wyoming.

It isn't like home, but at least the welding hut provides sufficient warmth and shelter so the welders were able to finish their job.

A sideboom tractor moves one of the welding huts into position so welders can tie together sections of the 22-in. line which CIG recently completed across wind-swept southern Wyoming.

"In some places we have three skids under the pipe and in other places there are four or five skids, depending on the ground," he said. "That's why we made these huts 8 ft high."

There is a 16-in. opening in the top of the hut to permit the escape of the fumes from the welder's electrode. Bridging this opening is an iron ring to which the side-boom 'cats are able to attach a hook in order to lift the huts from one location to another. Each hut weighs approximately 250 lb.

The interior of each hut is equipped with outlets for electric bulbs and usually two 100-watt bulbs are used to provide the necessary light. The power is provided by the same generator which supplies the current for welding.

Operations on the Wyoming construction project have been buffeted severely by the weather, but the addition of the welding huts has helped move the job along at a far faster pace than if the men had been content to sit back and wait for suitable weather. ■

GAS pipeline people

E. R. Griffith
Texas Gas

David Neil
Midwestern

Ray Fish
Transco

C. B. Ames
Fish Engr.

Earl Jolly
Plicoflex

C. L. PERKINS has been elected president of El Paso (Texas) Natural Gas Products Co., a wholly owned subsidiary of El Paso Natural Gas Co. He will continue as a vice president and director of the parent company. PAUL KAYSER, president of the parent company, was named to the newly created post of chairman and chief executive officer of the products subsidiary. C. C. CRAGIN, formerly an officer and now a consultant to the parent company, was elected a director of the subsidiary. HUGH F. STEEN, vice president and general manager of El Paso Natural Gas Co., was promoted to manager of pipeline operations. He will continue as a vice president and director.

JOE R. ROBINSON has been named manager of Middle West Coating & Supply with headquarters in Tulsa. Before joining Middle West, Mr. Robinson was with the pipeline engineering and personnel departments of Panhandle Eastern Pipe Line Co. and Pittsburgh Coke & Chemical Co.

C. L. PERKINS, president of El Paso Natural Gas Products Co., has been elected to the board of directors of Tekoil Corp.

DAVID E. NEIL is district manager of the Pittsburgh office of Midwestern Pipe Line Products Co., Tulsa. Before joining Midwestern, Mr. Neil was with Radio Corp. of America in both its engineering and electronics divisions.

ELDEN P. PRIEBE, assistant controller of Tennessee Gas Transmission Co., Houston, has been elected to membership in the Controllers Institute of America.

Houston Contracting Co. has promoted EARL C. NORRIS to general superintendent of field operations. Mr. Norris has been with Houston for 20 years. During the past 17 years, he has been spread superintendent.

HAROLD ROSOFF has been named sales manager of Ledeen Manufacturing Co., El Monte, Calif. He has been advertising manager for the past five years and will retain this position along with his new duties.

C. B. AMES has been elected president of Fish Engineering Corp., Houston. Following action by the board of directors, RAY C. FISH became chairman of the board. Mr. Ames formerly was a vice president of the company. He is one of the original founders of Fish Engineering.

E. RUSSELL GRIFFITH, formerly with the AGA, has joined Texas Gas Transmission Corp., Owensboro, Ky., as a research engineer. He will work on long-range planning problems important to the growth of the Texas Gas system.

RAY C. FISH, chairman of the board of Pacific Northwest Pipeline Corp. and president of Fish Engineering Corp., has been named to the board of directors of Transcontinental Gas Pipeline Corp., Houston.

ROBERT M. WOOLFOLK JR. has joined Texas Gas Corp., Houston, as chief engineer. Before becoming associated with Texas Gas, Mr. Woolfolk held a similar position with the California Co.

L. E. INGHAM, vice president of Texas Gas Transmission Corp., Owensboro, Ky., and a member of the board of directors, has retired after more than 46 years in the natural gas industry. Mr. Ingham will continue as a member of the board as a consultant.

J. D. DAVIS has been appointed to the post of assistant to Ed Parkes, president of United Gas Pipe Line Co. and Union Producing Co. and executive vice president of United Gas Corp. Mr. Davis, with more than 32 years' service with United and its predecessors, fills the post formerly held by D. D. DILLINGHAM JR. Mr. Dillingham was recently promoted to the position of executive vice president of United Gas Pipe Line.

E. E. FRYE has been promoted to vice president and manager of the petroleum division of J. F. Pritchard & Co., Kansas City, Mo.

CLARENCE MATTHEWS BUECHLER has joined the sales development department of Tube Turns, Louisville, Ky.

WALTER E. BIERY, general manager of the Mid-Continent Pipe Line Co., Tulsa, has been elected a vice president of the company.

NORM VAN BROCKLIN has been appointed district representative in Oregon and Washington for Plicoflex Inc., Pipeline Coating & Engineering Co. Inc., and Plico Inc. He is a well-known professional football player and a former All-American from the University of Oregon. He will work out of the new offices established in the Concord building in Portland. Plicoflex has appointed EARL L. JOLLY as district representative in San Francisco. He will represent all three companies throughout the northern California and Nevada area.

GAS pipeline news

W. T. Stevenson, president of Texas Gas Transmission Corp., Owensboro, Ky., is shown addressing a meeting of California financial analysts. The meeting was held in Los Angeles last month.

TGT's Stevenson tells of company's best year

Texas Gas Transmission Corp. has just completed the best year in its history. By the end of 1956, the company had substantially completed a two-phase expansion program designed to increase system capacity to meet requirements of firm utility customers through the winter of 1957-1958. And, its consolidated net income for 1956 amounted to $7,019,000, or $2.17 a share. This compares with $1.74 per share, on a smaller number of shares, in 1955.

This information was revealed by TGT's president W. T. Stevenson when he addressed a meeting of California financial analysts in Los Angeles in March.

In regard to the gas supply situation, Mr. Stevenson reported that his company is in the strongest position in its history. "Our 6.4 trillion cu ft of dedicated reserves approximate 20 times our 1956 sales," he said.

"Our sources of supply are well diversified, both geographically and geologically," he said, "and our supply system in south Louisiana places us in a very advantageous position to acquire additional reserves from some of the many new discoveries, both on and off shore, which are certain to be made. The potential was tremendously improved this year with completion of a new large-diameter line extending 125 miles southeast of our mainline at Eunice in south Louisiana, and paralleling the Gulf coast, into LaFourche parish. . . We are presently connected to 30 fields on the Louisiana Gulf coast. Two of the major producing fields dedicated almost in their entirety (in excess of 95 per cent) to Texas Gas—Lake Arthur . . . and East Lake Palourde—have grown to be two of the largest gas producing fields on the Gulf coast. Today the aggregate reserves dedicated to Texas Gas in these two fields are close to 2 trillion ft. . ."

Demands of TGT's market—55 utilities and municipalities between Alexandria, La. and the general area of Cincinnati, Ohio—have been increasing rapidly with diversification of industry in the area bordering the Mississippi and Ohio rivers.

In anticipation of expected growth in requirements, TGT is planning another expansion program, to be carried out in 1958. Mr. Stevenson believes that "we may need to add in excess of 100 MMcf/day of peak-day capacity in 1958. . . We have under contract a major portion of the gas supply that will be required."

Underground storage will meet some of the new demands. At present TGT has five storage fields capable of delivering, on a sustained basis, about 100 MMcf/day, or around 9 per cent of this winter's peak-day load. This 110-million figure will probably be doubled by the 1959-1960 season.

FPC seeks new legislation easing regulatory job

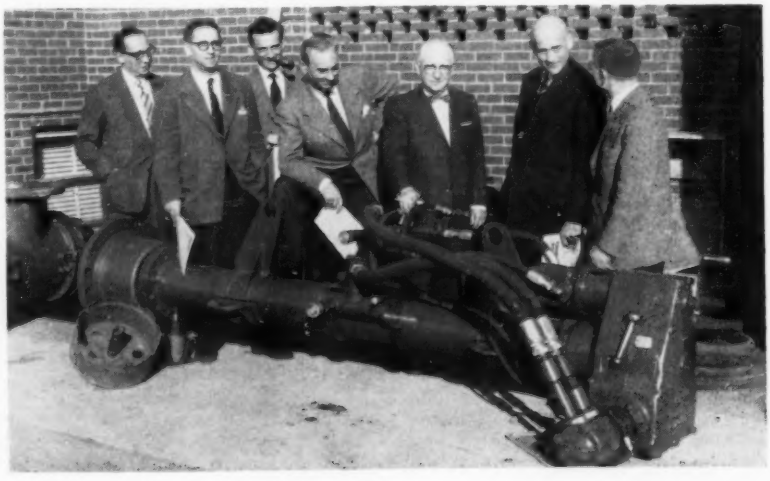
The Federal Power Commission has dropped its fight to get out of regulating independent gas producers. Instead it has asked Congress for legislation to make its regulation job easier.

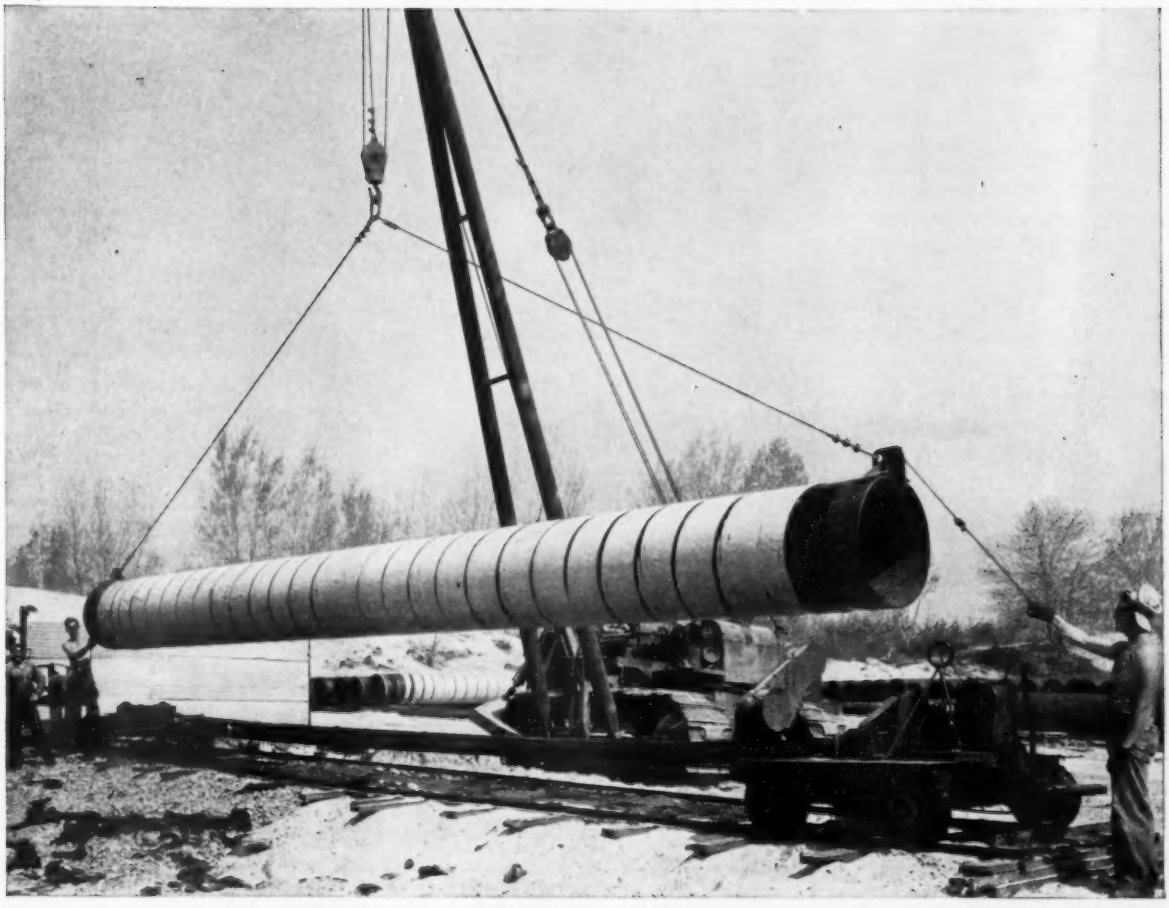
The proposed changes, if enacted, would leave independent producers under FPC control, but would free them from the traditional utility-type control the courts now require.

FPC chairman Jerome Kuykendall told the House Commerce Committee he no longer favors "exempting all producers of natural gas from federal regulation." As an alternative, he offered a five-point program.

Under the program, the produc-

Discovery of a natural gas field with an estimated reserve of 4 trillion cu ft at Lacq, France, prompted Gaz de France and La Societe Nationale des Petroles d'Aquitaine to send representatives to the U. S. to study American pipeline company methods of construction and operation. Viewing T. D. Williamson's Model 1200 tapping machine on their visit to Tulsa are (from left) Rene Berg, Jean Penaud, Jean Tellier, and Rolland Nory, Gaz de France; T. D. Williamson; Andre Amsler, Gaz de France; and Jean Dhuin, SN&PA.





ANOTHER LINK IN A MILLION-MILE CHAIN

This 30-foot section of pipe has been coated, wrapped, and is ready for service. It will take its place in the vast underground pipeline network that moves a greater volume than do trucks, railroads, ships and planes, combined.

It will become part of a great subterranean system that is vital to America's everyday living.

Let the facts speak for themselves. The gas industry alone handles over 10,000,000,000,000 cubic feet daily through more than half a million miles of transmission and distribution pipelines. A 185,000-mile pipeline system moves liquid petroleum products across the continent. In addition, there are many thousands of separate pipeline systems used to transport steam for power and heating —and to deliver water through municipal piping.

But there are problems—and one of the most important of these is corrosion. Pipeline companies and utilities must protect their metal pipe against the many corrosive elements that exist underground.

That's where Dearborn comes in. Dearborn's complete line of NO-OX-ID Coatings and NO-OX-IDized Wrappers provide both chemical and mechanical protection against moisture penetration and soil action—protection that lasts for decades—under ground or under water. That's why leading pipeline companies and utilities everywhere look to Dearborn for long-term protection against corrosion leaks and deterioration.

We will gladly consult with your engineers on the best NO-OX-ID Coating and Wrapper Combination for your next pipeline job.

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☐ Have representative call.

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Company.....

Address.....

City.....*Zone*.....*State*.....

ers would have the right to use the fair-field pricing method. This would replace the rate-base method.

Mr. Kuykendall also recommended that the new standard be applied to both independent producers and pipeline companies that produce some of their own gas.

A third recommendation would relieve the FPC of the problem of figuring a producer's cost of service—an essential factor of the rate-base method. The FPC has said its utility-type method of figuring cost of service often gives unrealistic results when applied to producers.

Fair-field pricing, if permitted with no strings attached, would generally put a higher value on a producer's gas than the rate-base method. But the courts have said the commission, to use fair-field pricing, must make a rate-base calculation for comparison. As a result, fair-field pricing hasn't been successfully used.

The fourth point of the program calls for the elimination "of certain types of escalation clauses in producer contracts." This is a concession to local utilities and other gas distributors, who have claimed that escalation clauses have resulted in sharp and unpredictable rises in the cost of gas.

The final recommendation would eliminate the present requirement that independent producers apply for FPC certification. This is a formal step requiring much paper work, and the commission feels it can properly regulate the producers without certification.

If the five-point program were put into effect, Mr. Kuykendall explained, the commission would have to order reductions in the rates charged by some producers. But, he said, the FPC would have a "moral right" to raise other rates if it found they were too low.

(*Continued on page* 144)

Plicoflex Inc., Pipeline Coating & Engineering Co. Inc., and Plico Inc. have moved into new larger quarters in Los Angeles. Expanded activities in both the plant and executive offices made the move necessary. The companies, which also maintain branches in San Francisco; Portland, Houston, and Calgary, Alberta, specialize in all phases of pipeline coating and corrosion prevention lines.

IT'S THE DIE-CAST ALUMINUM HOUSING FOR THE NEW TULSA® SINGLE SPEED, MEDIUM DUTY POWER TAKE-OFF!

The die-cast aluminum housing makes this NEW TULSA power take-off "light as a feather" . . . gives it all the strength and durability for which the TULSA line is famous. Output shaft rotates on two needle bearings and is manufactured in three sizes—13/16", 7/8" and 15/16". It's available with either cable or lever control. Designed and built to cover the full market range of a thoroughly dependable, low priced, single speed power take-off for medium duty work. Same nationwide distribution and service as offered for the full TULSA line of power take-offs.

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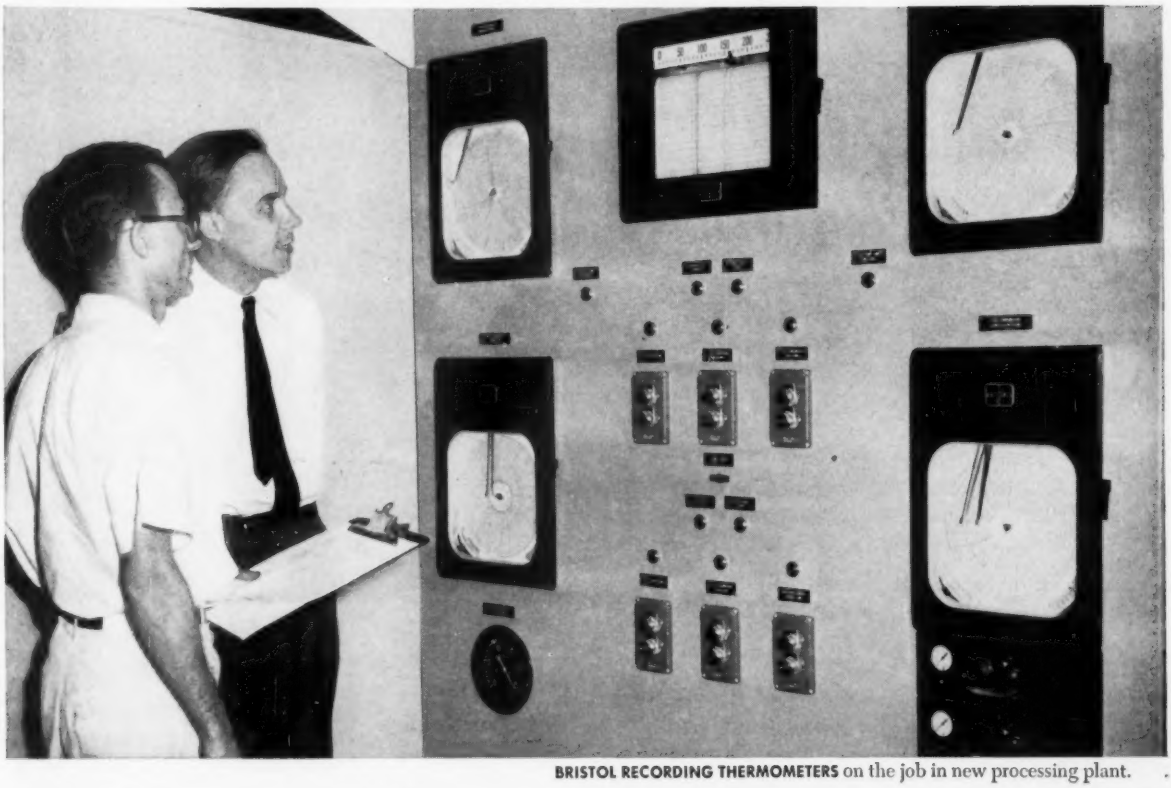
TULSA, OKLAHOMA DIVISION OF VICKERS Inc.

WHAT'S NEWS AT BRISTOL...



BRISTOL RECORDING THERMOMETERS on the job in new processing plant.

Can you pass this recording thermometer quiz?

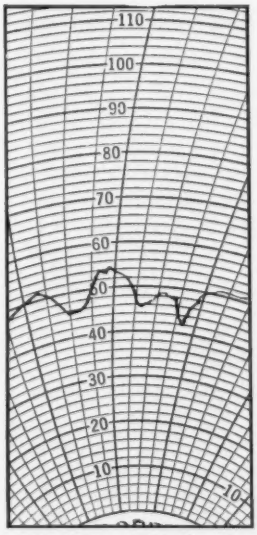
Question: ***Why do Bristol Recording Thermometers continue to lead the field?***

Answer: ***Because of Bristol's continuous research and development program. Two outstanding results of this program are:***

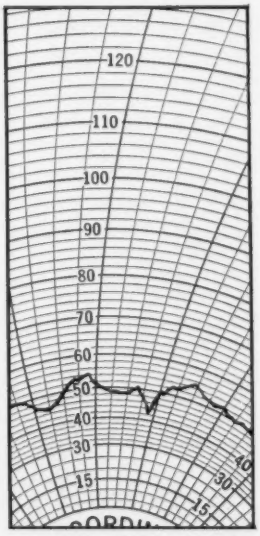
1. The 2L Uniform-Scale Vapor Pressure Thermometer which gives you all the advantages of vapor pressure thermometer actuation without the problems of the conventional non-linear increasing scale—*greatest advance in recording thermometers in 25 years.*

2. A basic improvement that eliminates ambient temperature effects. Whether you are measuring *above, below* or *at* ambient temperature, you get the same unvarying accuracy with the new Bristol Vapor-Pressure Recording Thermometers.

Want to know more? Write today for free 48-page bulletin T840 on the complete line of Bristol Recording Thermometers, liquid, vapor-pressure, and gas filled for every application. It tells all about typical installations, ranges, charts, bulbs, tubing. The Bristol Company, 113 Bristol Road, Waterbury 20, Conn.



NEW LINEAR CHART for 2L. Note easy readability due to equal chart increments.



OLD NON-LINEAR CHART. Note how scale values crowd together at bottom.

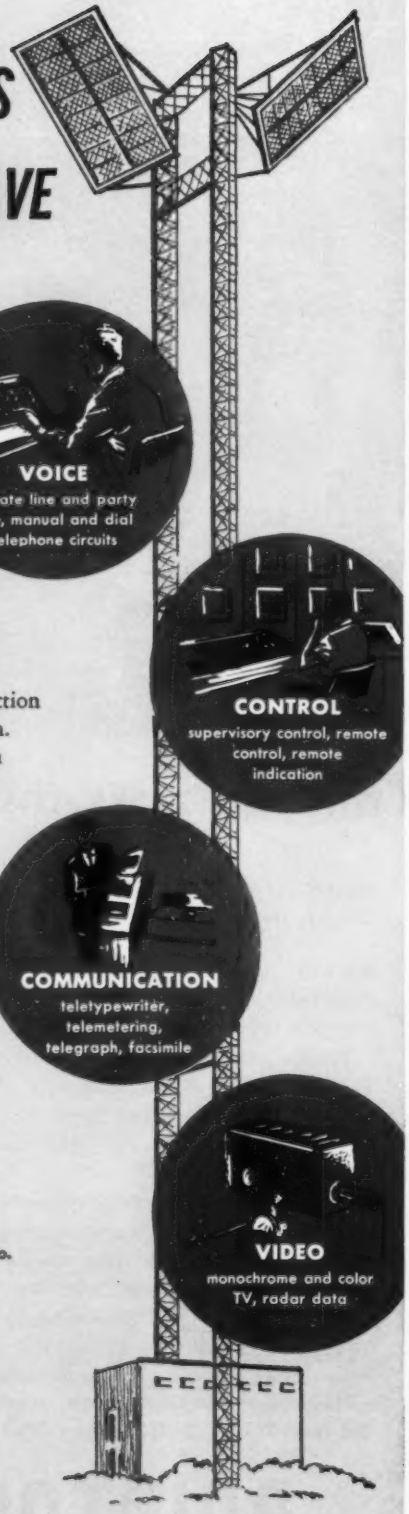
6.82

BRISTOL *TRAIL-BLAZERS IN PROCESS AUTOMATION*

TRADE MARK BRISTOL'S REG U.S. PAT OFFICE

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

DO A BETTER COMMUNICATIONS JOB WITH MOTOROLA MICROWAVE



Motorola multi-channel microwave facilities can transmit:
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ECONOMICAL The most economical type of multi-channel communication.

EASY TO EXPAND Channels can be inexpensively added.

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PRIVATE Owner has complete control of communications facilities at all times; narrow beam assures private communication.

VOICE
private line and party line, manual and dial telephone circuits

CONTROL
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VIDEO
monochrome and color TV, radar data

Modern industry is increasing the emphasis on automation, data transmission, and centralized control in order to provide better protection of personnel and property, better service, and more efficient operation. Motorola microwave can provide the *complete* communications system needed for this type of operation.

More miles of MICROWAVE—IN and OPERATING

Working dependably over the years, Motorola microwave systems ranging from 7 to over 1000 miles in length are operating in all types of applications and in all kinds of weather. This greater acceptance and experience means engineering and production "know how"—equipment which performs better, lasts longer, and costs less to maintain. These extra dividends repeatedly appear in operational records of Motorola users.

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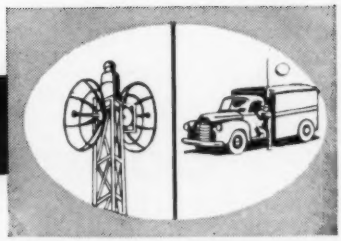

Drawn-out hearings expected in microwave case

By FRANK CHAPMAN

We asked our Washington representative, Neil Regeimbal, to give us the latest word on the microwave radio controversy. Here is his direct, exclusive analysis:

FUTURE of industrial usage of microwave radio by pipelines, utilities, and producers won't be settled for a year or so.

Officials of the Federal Communications Commission will begin late in April to collect oral testimony on the need for limiting microwave use, and the methods by which it can best be controlled.

Most close observers of the commission, including several key staff members of the agency, believe it is highly unlikely that drastic changes in microwave will be made.

It is also considered highly unlikely that the entire microwave range (890 megacycles and up) will be reserved for common carriers such as telephone and wire services, or that the pipeline industry will be restricted in its use.

Pipelines, these sources admit, have a "pioneer" interest and right in microwave because of their work in developing this communication system.

Producers and distributors, however, may not be as firmly entrenched, and may or may not be due for limited usage or barred from usage.

The microwave controversy is mostly an economic problem, although engineering and technical questions also play a part.

The commission's decision to conduct the study was touched off by applications for microwave permits by the truckers, some large fruit growers, and department and retail mail order chains. These firms want to use microwave to transmit data between their plants or stores.

The fight is now shaping up between four firms representing the common carriers (telephone and telegraph) and all other industrial users. Common carrier spokesman at the hearings will be the Bell Telephone System, Western Union, the General Telephone System (independent telephone companies), and Lenkurt Manufacturing Co., which supplies most of the independent phone companies.

The common carriers were expected to ask that most of the microwave range be turned over for common carrier use. Fire and safety use, and perhaps some other public uses, were expected to be omitted from the carriers' bid for control.

If the carriers do seek such sweeping control, most observers agree they will expect to get only part of what they ask.

The carriers are believed to be ready to settle for FCC limitation on microwave use to common carriers, pipelines, and public safety. The carriers reportedly wouldn't be too unhappy to see microwave restricted to existing types of users, including utilities, but excluding the truckers, big stores and industrial plants.

Most industries want completely unlimited use. Several witnesses during the next few months will admit that while the chance of their using microwave in the future may be practically nil, they want the right to choose more than one type of communication system.

This is the economic question. Telephone and telegraph systems contend that they can handle microwave on a large commercial scale cheaper than a firm can set up its own system. And they also say they need the revenues from commercial service between stores, plants, or offices to back up a commercial long-range microwave system and make it sound.

Carriers claim that a saturation point on microwave is in prospect. Most of the industrial users dispute this, saying that good usage and careful engineering will prevent microwave from becoming overcrowded for years. Both sides bring along engineers and technicians to back them up.

Most likely outcome of the study will be a limit on the types of industries that will be permitted to use microwave. Most present users will be given space. The newcomers and some marginal users may be banned.

This carve-up of the microwave pie will probably be handled by a series of proposed rule-making actions by the commission, a spokesman says. Arguments on each proposed new rule would be permitted in writing—and to some extent the arguments to be presented in the next few months would be rehashed. Most of the rules would go through substantially as proposed, FCC officials say, if this system is followed.

First of these new rules on microwave use, assuming that the commission does use this method, should come out about the first of next year. It would take several such rules to cover all the questions posed in the microwave controversy.

The rules would have the effect both of limiting future use of microwave, and also of giving assurances as to who will and will not be given space.

There is also a possibility that in addition to limiting the types of industries to which microwave

(*Continued on page* 140)

WITH **NODULAR IRON** CYLINDERS

DESIGNED FOR 2000 PSI SERVICE...

COOPER-BESSEMER ADDS

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TO OLD COMPRESSORS

At the Rockport and Ripley compressor stations of United Fuel Gas, Charleston, West Virginia . . . nodular iron cylinders have "up dated" 25 to 30 year old Cooper-Bessemer twin-tandem horizontal compressors.

These new Cooper-Bessemer nodular iron cylinders provide greatly increased flexibility while keeping the units at full capacity over a wide range of pressure conditions. Gas to storage is handled at 620 to 685 psi suction and 1000 to 1800 psi discharge. Delivery from storage is at 300 to 700 suction and 800 to 950 discharge.

If you are open to ideas on cutting costs and improving the efficiencies of your older compressor installations, be sure to check with Cooper-Bessemer.

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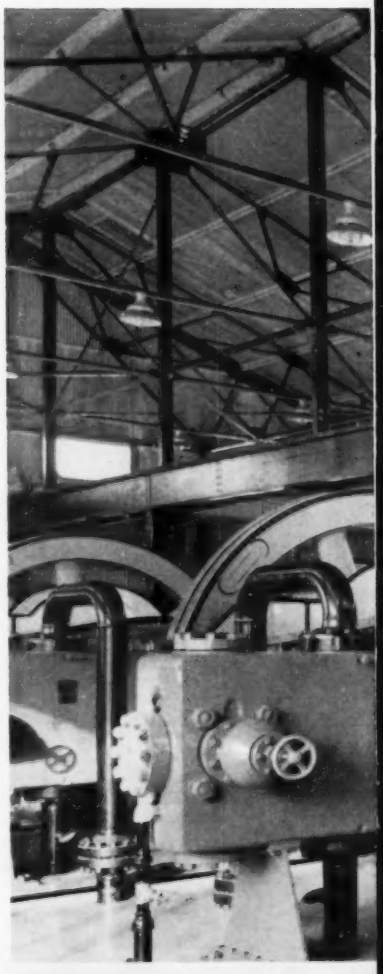
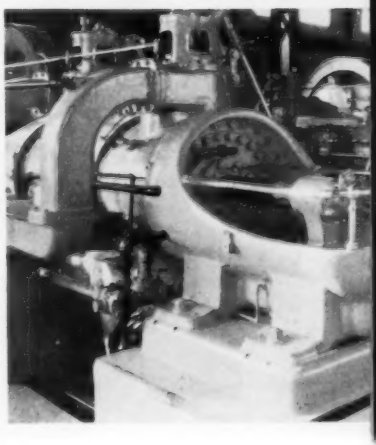
ENGINES: GAS · DIESEL · GAS-DIESEL COMPRESSORS: RECIPROCATING AND CENTRIFUGAL, ENGINE OR MOTOR DRIVEN



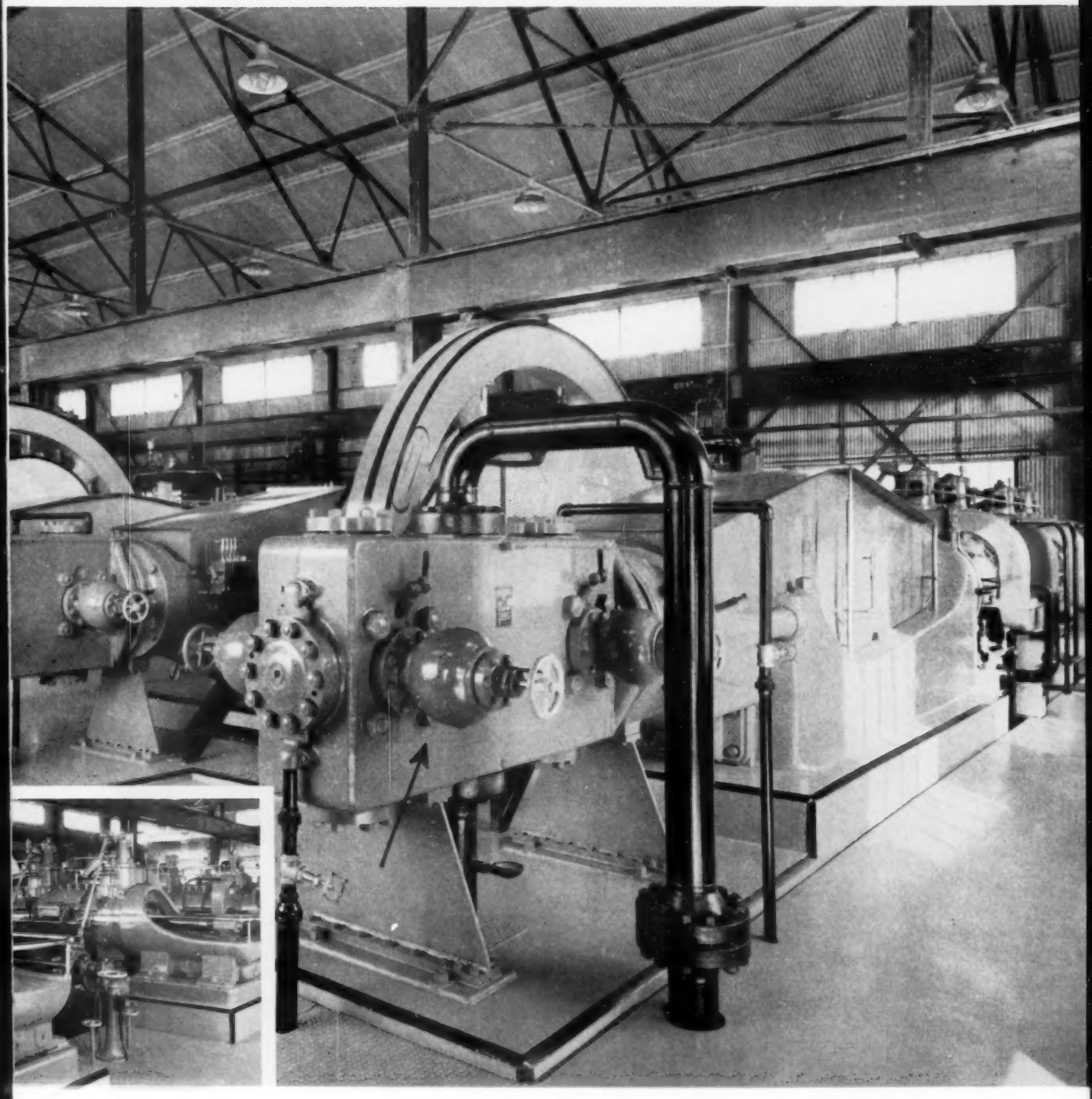


These Cooper-Bessemer nodular iron cylinders are designed for 2000 psi working pressure. Two-volume design permits 19 stages of unloading per compressor.

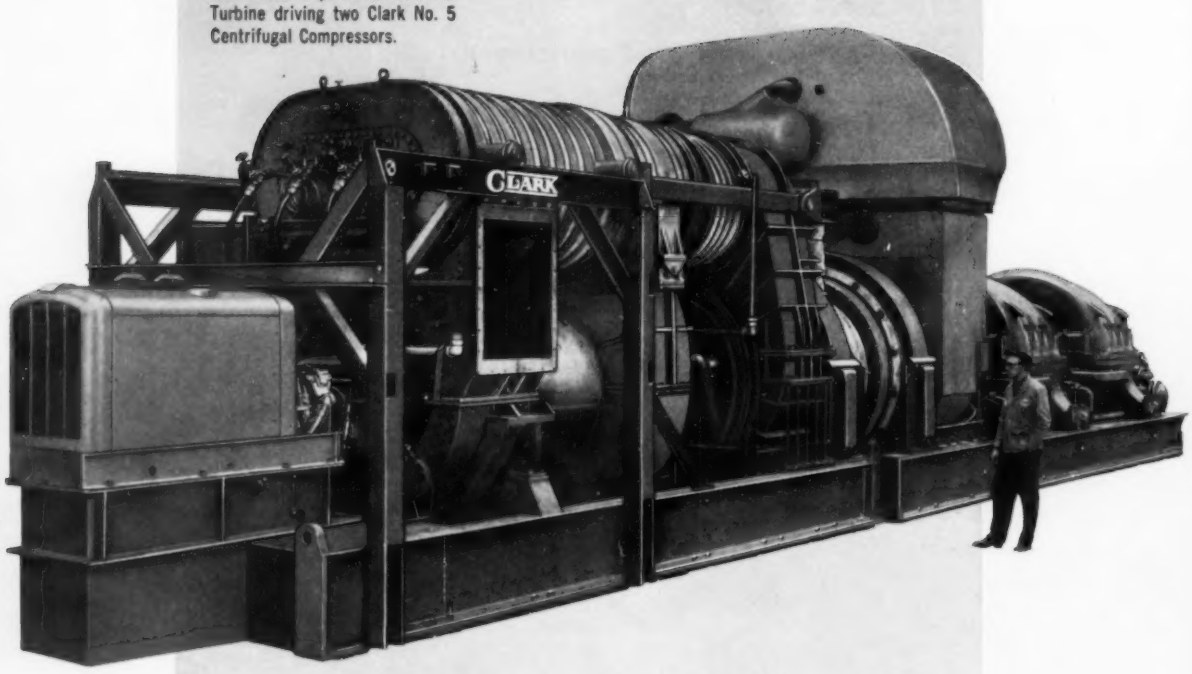
Designed for 2000 psi working pressure . . .

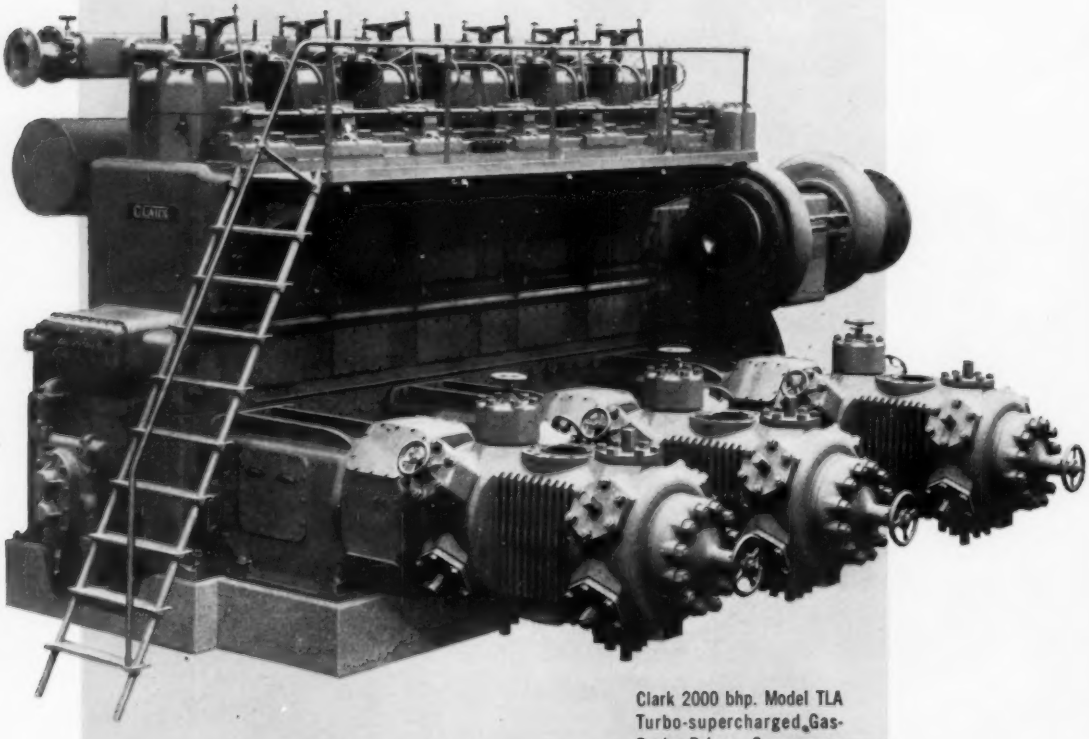
Cooper-Bessemer nodular iron cylinders permit 19 stages

of unloading per compressor



Clark 8500 bhp. Model 302 Gas Turbine driving two Clark No. 5 Centrifugal Compressors.





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Prejudice can add substantially to the cost when selecting compressors. At Clark, we build both gas turbine-driven centrifugal compressors and gas-engine-driven reciprocating compressors. In both instances the compressors and drivers are the most modern available.

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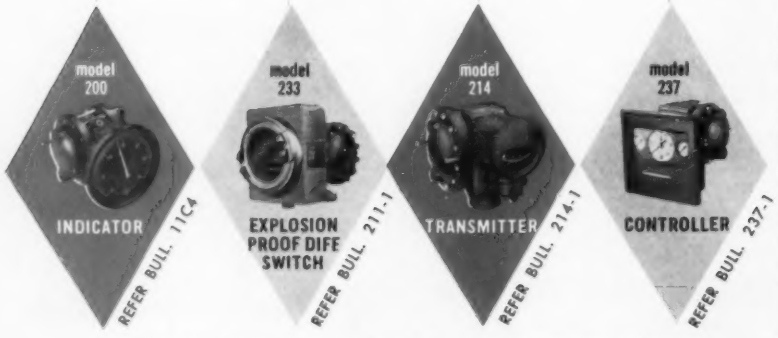

For further information, contact Barton Sales Representatives in most principal cities. 202-357

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communications • *Cont'd.*

from page 135

permits will be granted, the new rules may limit the uses to which licensees can put their microwave equipment.

Timetable for the FCC study (Docket No. 11866) is pretty well set now.

Firms, associations, and persons who have asked for permission to appear at the "fact-finding" hearings had until the end of March to submit their full cases in writing to the staff of the FCC.

These cases will not be made public until shortly before the hearings. Witnesses will not get copies of cases filed by other witnesses until they are all made public.

During most of April, the FCC staff will go over the written cases. In some instances, further information or clarification will be requested by FCC. A witness list will be drawn up before the hearings open late in April so that duplication will be eliminated from the hearings.

The FCC originally set aside 30 days of hearings for the microwave study. It appears, however, that with more than 200 witnesses, the hearings will run longer. At the rate of about two days of hearings a week, the agency expects this phase to run at least until Aug. 1. There is a possibility that some witnesses will be testifying at night or weekend sessions.

After the hearings, FCC plans to give the witnesses an opportunity to answer other witnesses, probably in writing. If oral rebuttal is permitted, it will be restricted to about five days, an FCC official says.

After all the evidence is in, the agency will begin to sift it and make policy decisions. It is highly unlikely, an FCC source says, that a single specific report or order will be issued covering all questions raised in the study. The series of rule making proceedings is expected to be used.

First witness at the hearings will probably be the Operational Fixed Microwave Council, a group of industrial users, which will turn over technical data to the FCC, but will not speak for its members on the controversial points. ■

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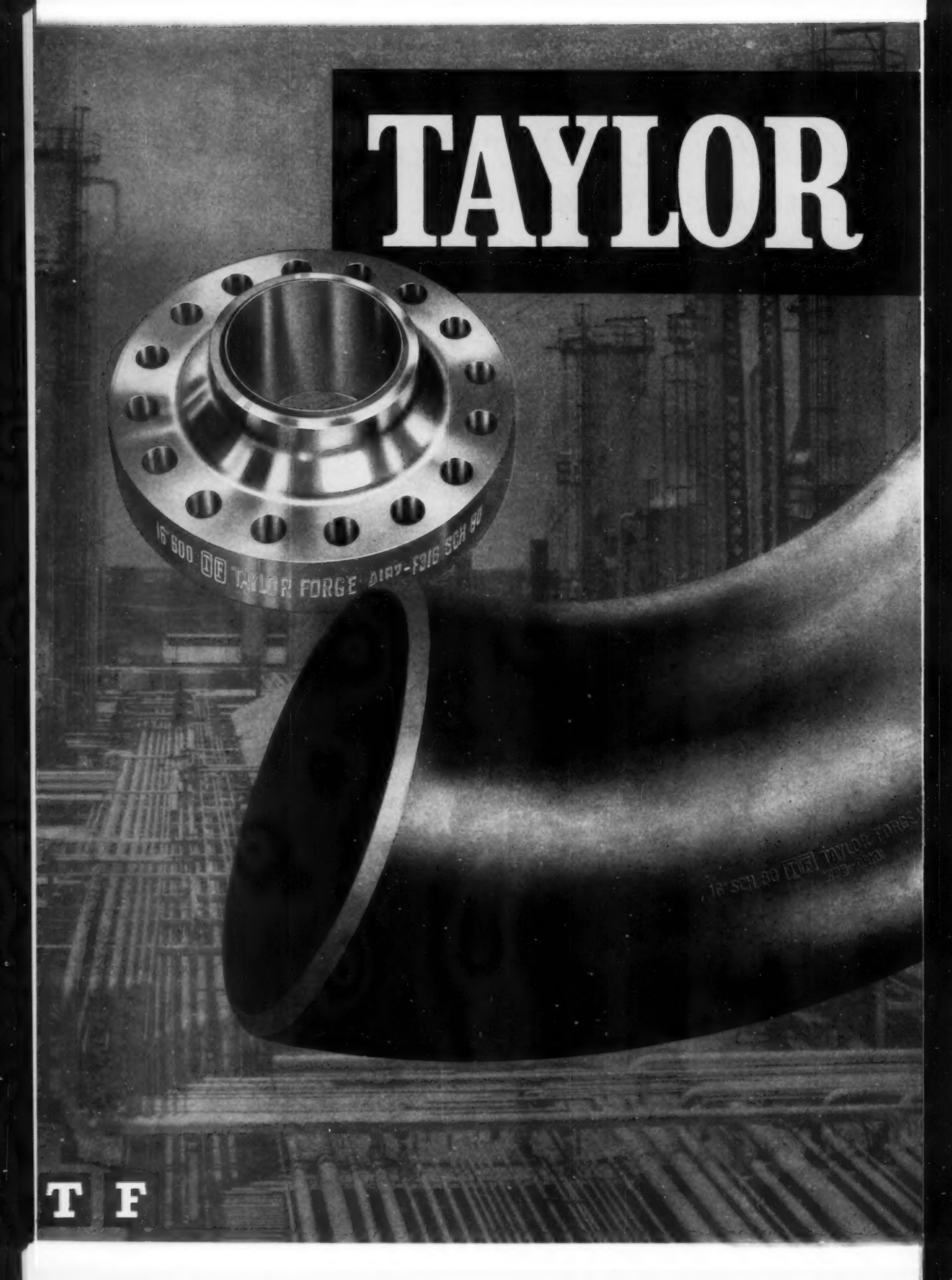
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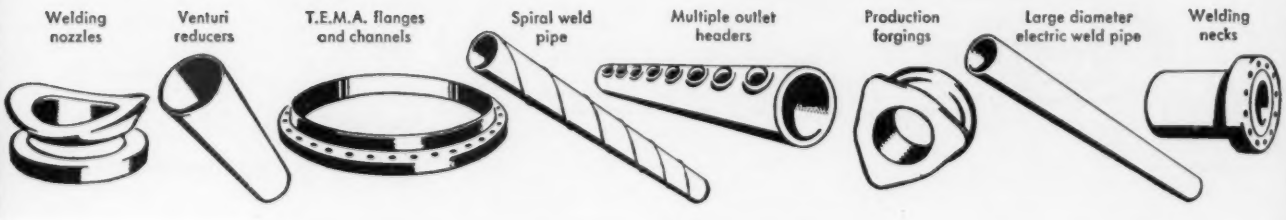

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From mining of the ore through Lone Star's precision pipe mills..Lone Star's API pipe quality is controlled in every step of manufacture. Lone Star line pipe has uniform wall thickness and roundness, is easy to field weld and easy to bend.

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pipeline news • *Cont'd.*

from page 132

Utility and pipeline sales up 8.2 per cent in '56

An 8.2 per cent increase in total sales of gas utility and pipeline industry to ultimate customers was shown in 1956. According to the AGA report, natural gas sales gained 9.0 per cent while manufactured gas and mixed gas, because of the steady conversion to natural gas, dropped 6.4 per cent.

Total gas sales for the year were 72,285 million therms compared with 66,834 million in 1955. Natural gas gained from 63,337 million to 69,012 million therms. Manufactured gas sales declined 27.7 per cent, from 457 to 331 million therms. Mixed gas dropped 3.2 per cent, from 3039 to 2942 million therms.

Transco files for increase in capacity

As a major part of its $113 million construction program set for this year, Transcontinental has filed an application with the FPC for a certificate to construct $61.5 million of new facilities.

Transco's president, Tom Walker, said that a large part of the construction will be seven new mainline intermediate compressor stations in Louisiana, Mississippi, Alabama, Georgia, North Carolina, and two in Virginia. Additional compressor engines will be installed in nine existing stations.

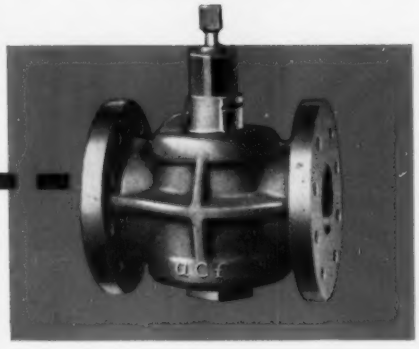
In Texas a total of 229 miles of gathering laterals will be built to bring new gas reserves into the Transco system. Five new gathering meter stations and five dehydration stations are planned.

This new application includes 42 additional miles of 36-in. pipe and 16 miles of 30-in. loop, but Mr. Walker pointed out that most of the mainline looping program for this year is contained in another application already before the FPC.

Mr. Walker said that construction contained in the new application will result in an increase in daily allocated capacity of about 111.4 MMcf and include facilities to haul gas for Virginia Electric & Power Co. In a recent agreement, Transco agreed to move daily from Louisiana gas fields to Virginia approximately 25.6 MMcf for VEPCO.

Increases in daily allocations from Transco's system will include an additional 44 MMcf to six cus-

Hot Tapping through acf Round Port Lubricated Plug Valves



A standard acf Round Port Valve is the perfect valve to use for making hot taps.

The round port of the plug and bore through the body provide a full, unobstructed passage for the tapping drill. True and perfect alignment of port and body bore prevent damage to seating surface.

Threaded or flanged acf Round Port Valves can be used. The valve is attached to the weld nipple, tapping machine mounted on the valve and hot tap made in the usual manner.

When the hot tap is completed, your acf Valve will give you dependable, trouble-free service years ahead. Features which assure perfect performance are split-second, quarter-turn opening and closing; non-wedging cylindrical plug; Teflon* head gasket and the right acf Lubricant to seal securely and prevent wear and abrasion.

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A unique four-cylinder design provides direct-acting, balanced torque to the valve stem. The use of cylinders offers the basic construction advantages of simplicity and sturdiness, resulting in long and trouble-free life.

QUAD units provide auxiliary manual hydraulic operation. The gas and oil systems in all Ledeen QUADS are completely separate, eliminating any gas-oil interface.

Features

- **Balanced torque delivered to valve stem through four-cylinder construction.**
- **Gas and oil systems are entirely separate. No gas-oil interface.**
- **For periodic testing, detachable lever permits operation of actuator and controls without turning main valve.**
- **Easy field installation without modification of the plug valve.**
- **Available in wide range of torque capacities, and with a variety of control systems.**

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pipeline news • *Cont'd.*

tomer companies in the New York-New Jersey-Philadelphia metropolitan area, 25 MMcf to the Columbia Gas System for delivery in Maryland, 9 MMcf to the Eastern Shore Natural Gas Co., a new customer, and 4.6 MMcf to two companies serving the North Carolina-South Carolina Piedmont area.

The FPC has authorized Transco (Docket G-11585) to construct $2.4 million facilities to connect its system with gas reserves to be obtained from the Gulf of Mexico. About 28 miles of 16-in. purchase lateral line and a purchase meter station for receiving gas from the Block 45 field, 7.5 miles off Cameron parish, La. will be built.

Two other Transco projects have a commission okay. One is a $1.4 million addition to two compressor stations in southeastern Louisiana and southern Mississippi. Both will have 2500-hp additions which will increase deliveries of gas to the City of Shelby, N. C. and give the company additional operating flexibility.

Under the second authorization (Docket G-10626), Transco will spend $3.6 million to increase horsepower at stations in Victoria county, Nueces county, Refugio county, and Harris county, Texas; and Beauregard parish, La.

Gas legislation prospects dimming for 1957

The gas industry, despite long and sweat-producing efforts to work up a non-controversial gas bill, may well see 1957 pass without congressional legislation.

And it's becoming increasingly important to some members of the industry to get "out from under" the pressure of government control.

The anger among Democrats at President Eisenhower's veto of last year's gas bill is as hot now as it ever was.

Rep. Oren Harris (D.-Ark.), a co-sponsor of last year's bill and this year chairman of the House committee which has jurisdiction of another bill, is still boiling mad. Mention of a gas bill sends the usually affable congressman into grumpy ill-humor.

"If they (the Eisenhower Administration) don't ask for a bill, there won't be any gas bill this year," Representative Harris told GAS recently. "I said before, and I say again, when they let us know

BRONZE TRIM FIG. 333

Both of these OIC Duo-Bolt gates have special stems. The Fig. 333 stem is OIC *Alloy-40* in sizes 2″ and under . . . corrosion-resistant bronze with 20 to 30 times longer life than most other stem bronzes. It will not gall or seize. In fact, this alloy has all but eliminated stem replacement. The Fig. 337 stem is nickel-plated steel . . . highly resistant to pitting in the packing area, sturdy and long wearing.

Design includes bonnet drain ducts . . . recessed gasket seat

To protect against freezing, bonnet ducts allow complete drainage of the upper part of the valve. The male-female, gasketed body-bonnet connection assures a tight joint and prevents blown gaskets.

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On sizes 2″ and under, bronze trimmed valves include cast-in seat rings, *rolled* to make doubly sure that they cannot loosen in service. On sizes 2½″ and larger, seat rings are screwed in. Seats are integral on all-iron trim valves. Both types include a button-head stem-to-wedge connection, flexible for non-binding wedge seating.

Immediate availability . . . long line

Order Duo-Bolt gates from your OIC Distributor or his field store. Sizes: ¼″ to 4″, screwed or flanged ends. Working pressures: 125 to 150 lbs. WSP, 200 to 225 lbs. cold WOG, non-shock. Request Form No. 1007 for more information.

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what they want, we'll go to work—not before," he barked.

Representative Harris leaves little doubt that he personally doesn't intend to hold hearings on a gas bill until the Administration takes the initiative. He undoubtedly has the support of the Democratic leadership of Congress (Speaker of the House Sam Rayburn of Texas).

That apparently leaves the gas bill question at a stalemate. Despite the President's warm endorsement of gas legislation this year, there is considerable doubt that he or his administration will make the first move and actually introduce a bill. It is believed that the White House would rather endorse a bill after it has been introduced.

This apparent deadlock is just the icing on the cake of troubles supporters of gas legislation are facing.

Current oil price investigations, flourishing on both sides of Capitol Hill, have once again placed the oil-gas industry in an unfavorable public relations light. This harmful publicity comes on top of the public relations problems caused last year by the Case incident, and the subsequent court actions leading to fines and suspended jail sentences.

Although not necessarily connected to the merits or demerits of gas legislation, the problems of the oil producers make the entire subject of gas legislation slightly painful to many members of Congress.

Gas industry officials, who believe they've worked out a compromise bill that the utilities, pipelines and producers can agree on, still have another problem. It was hoped by supporters of legislation that they could remove virtually all opposition by taking a compromise approach to legislation.

But they didn't reckon on the unions, nor on many a city mayor. The unions are already filling their magazines and newspapers with stories bitterly opposing any legislation to even partly free independent gas producers.

A group of mayors claiming to represent 16 million residents of a number of cities has been formed to fight any new legislation to free gas producers. The National Committee of Mayors is headed by Mayor Robert F. Wagner of New York City. Milwaukee Mayor Frank P. Zeidler is one of the chief spokesmen for the group.

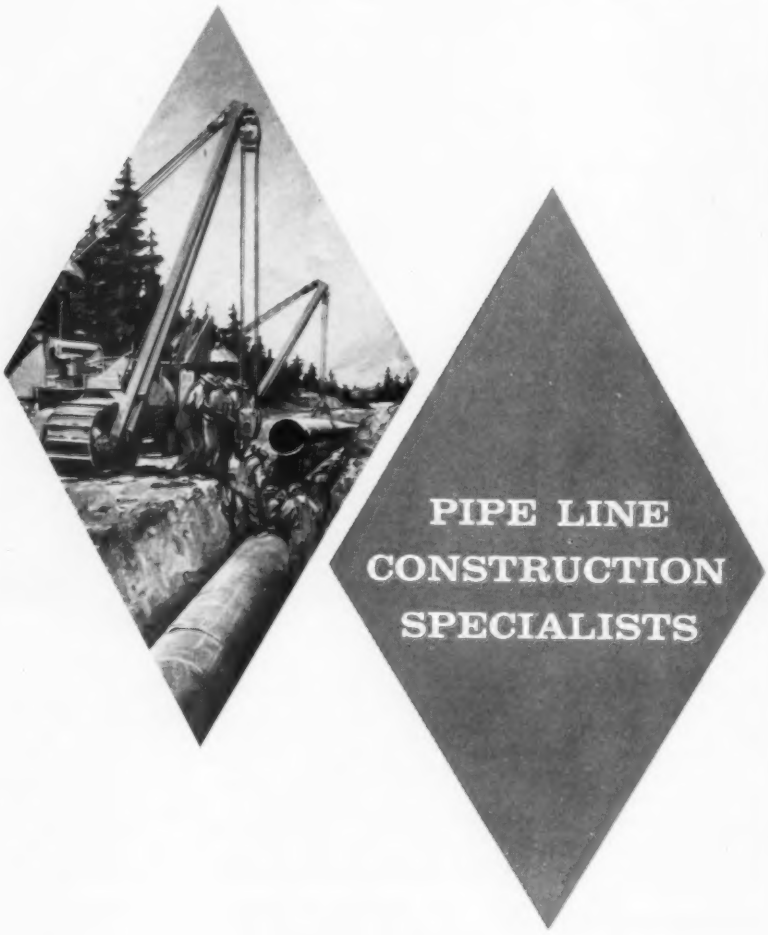
The Federal Power Commission —although tightening its control over independent producers under the now-existing laws—urges in its annual report that gas legislation be enacted. The agency favors a bill that would permit it to set producer prices on a commodity basis, without using a rate base or utility type of approach.

FPC also urges elimination of certificates for producers; elimination of any requirement that costs or revenues from other products obtained with gas production be considered in setting gas prices; equal treatment for independent producers and pipeline-owned producers; and outlawing of spiral or favored nation escalation clauses in gas production contracts.

El Paso adds to plans for system expansion

El Paso Natural Gas Co.'s current construction program, already authorized and under construction, will be supplemented by new proposals presented to the FPC (Docket G-11797).

Under the new plan, El Paso will sell and deliver an additional 185



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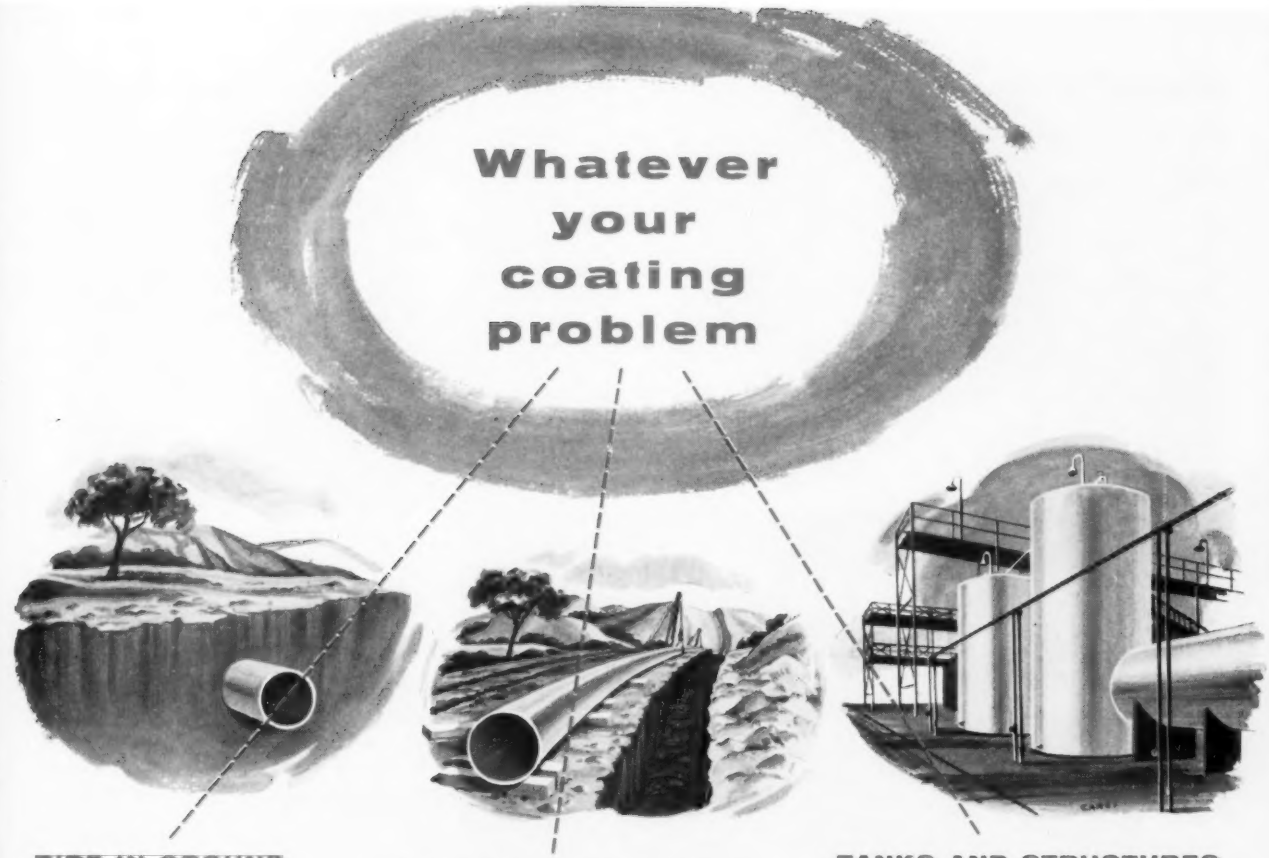

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MMcf/day to present customers.

The application states that 75 MMcf/day will be delivered jointly to Southern California Gas and Southern Counties Gas companies; 75 MMcf/day is slated for Pacific Gas & Electric Co.; and 35 MMcf will be delivered to existing customers in Arizona, principally in the Yuma area. The project will cost an estimated $105 million.

Sources of gas are as follows: 40 MMcf/day from Sonora gas pool in Sutton county, Texas; 5 MMcf/day from East Panhandle field in Wheeler county, Texas; 40 MMcf from various fields in Borden and Upton counties, Texas and Lea county, N. M.; and 100 MMcf from various Pictured Cliffs fields and the Mesa Verde field in San Juan and Rio Arriba counties, N. M.

Included in the field facilities proposed are 224 miles of 20-in. to 10-¾-in. line (176 miles of 20-in.); additional compression totaling 27,850 hp; and gasoline plants, dehydration plants, an amine recovery plant, and additional gathering systems in Lea county, San Juan field, Sutton county, and Panoma field.

Mainline facilities include 215 miles of loops ranging from 34 down to 6-⅝ in.; and 58,900 hp additional compression.

CIG moves measuring facilities outside cities

The FPC has authorized (Docket 10850) Colorado Interstate Gas Co., Colorado Springs, to construct new facilities at an estimated cost of $1.6 million and to abandon, transfer or salvage other facilities estimated to cost $339,211.

New construction involved includes three metering stations, one in south Denver, one in north Pueblo, and the third in south Pueblo; and 35 miles of 26- and 8-in. line in Denver and Portland, Colo. Transfer property is in Denver, Pueblo, and Canon City.

Colorado Interstate said that the purpose of the transfers and new construction is the consolidation of its measuring facilities outside the respective city limits. The company said that the rapid growth of the areas involved has surrounded its high pressure transmission facilities and meter stations with residences, schools and busy streets and are causing hazardous conditions.

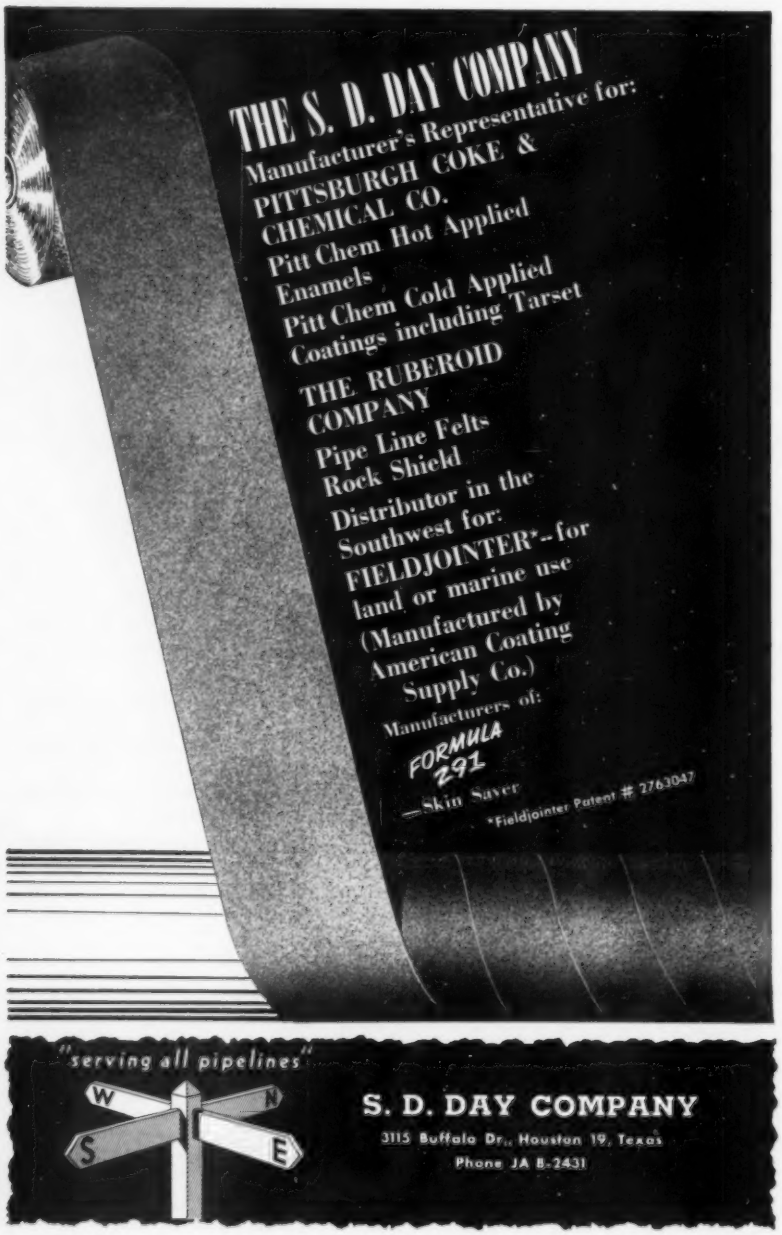
Coal interests lose in Cities Service case

FPC Examiner Richard Ivins has rejected arguments by coal interests and authorized Cities Service Gas Co. to supply gas on an interruptible basis to the Pleasant Hill, Mo. electric generating station of Missouri Public Service Co.

The decision (Docket G-10458) also authorized Cities Service to construct approximately 11.5 miles of line to replace existing facilities in Johnson and Cass counties, Mo.

The proposed construction and abandonment and the interruptible service were first proposed in a July 1954 application. In June and August 1955, the commission authorized the construction and abandonment but denied the sale to the electric generating station because Cities Service had failed to show an adequate gas supply. Cities Service, however, did not accept that certificate and subsequently filed the present application.

In authorizing the sale at this time, Examiner Ivins ruled that



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2. Dielectric Test Equipment

1. Sub-Zero Cabinet
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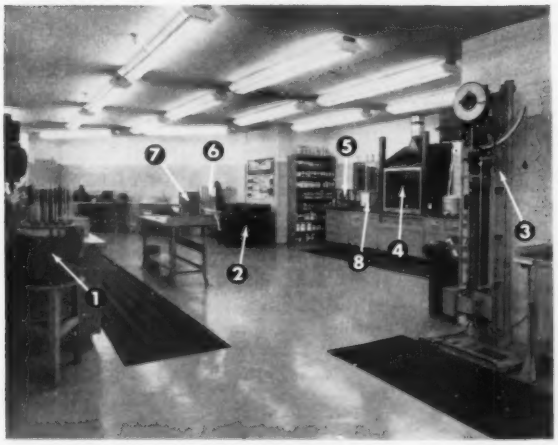

1. Comet Aging Block
2. Sub-Zero Cabinet
3. Scott Tester
4. Oil Immersion Apparatus
5. Gravimeter
6. Air Permeability Apparatus
7. High Powered Microscope
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SINCE 1932—PRECISION IN RUBBER—METAL—PLASTICS

pipeline news • *Cont'd.*

Cities Service's gas supply has been shown to be adequate to permit the proposed sale. The Gas Service Co., Cities Service distributor in the area, will supply the first 1 MMcf/day to the generating station, with any excess to come from Cities Service. The examiner's decision is conditioned to limit Cities Service deliveries to 13,095,000 cu ft daily.

In rejecting the opponents of the proposal, the presiding examiner said that any detriment that the coal intervenors may suffer is "far outweighed by the benefits which will accrue through the sale to the applicant . . ." He declared that economic loss to the coal interests is not in itself a valid reason for refusing a certificate and that to give such an effect to the Natural Gas Act "would be to stultify the natural gas industry, reserving all markets to competing interests regardless of the public benefits to be derived from natural gas service." Moreover, he continued, the act does not confer upon the FPC authority "to promulgate a national fuels policy, or to act as the conservator of natural gas or of any other natural resource."

Gutride succeeds Fuquay as FPC secretary

Joseph H. Gutride, an FPC staff member for nearly 21 years, has succeeded Leon M. Fuquay as secretary of the commission.

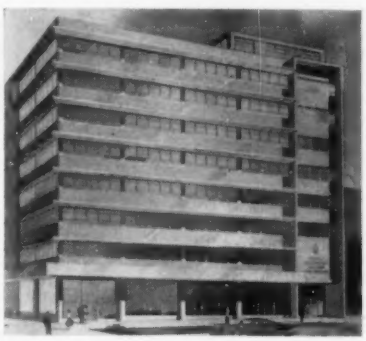
Mr. Fuquay, who is retiring, joined the commission in 1931 at the time it was starting out as a full-time independent regulatory body. For nearly 21 years he served as secretary. During his tour of duty, Mr. Fuquay has been the principal source of contact between the FPC and the regulated gas and electric industries and the public.

Mr. Gutride, who joined the FPC in March 1936, has been assistant secretary of the commission since 1942 and prior to that was the principal assistant to the secretary.

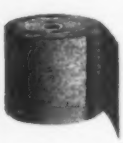
36-in. looping planned by Texas Illinois

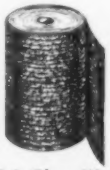
Looping of its existing 30-in. line serving the Chicago area is proposed by Texas Illinois Natural Gas Pipeline Co., Chicago, in a recent application filed with the FPC (Docket 11433).

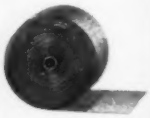
The loop, estimated to cost $1.7 million, consists of 9.5 miles of 36-in. line paralleling the 30-incher from a point on the north bank of the Illinois river to the Texas Illinois regulator station at Joliet.



Construction of Pacific Northwest Pipeline Corp.'s new $2.5 million headquarters building in Salt Lake City is slated to get underway almost immediately. In addition to eight floors, the building will have conference rooms and offices on a portion of the roof. The building will display almost 50 per cent heat-resistant glass area in aluminum-framed windows. Three electronically operated elevators will service the completely air conditioned structure.


J-M Asbestos and Tar Felt


C-R-C Glass Wrap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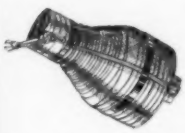
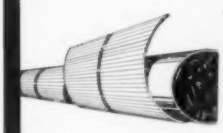

Casing Seals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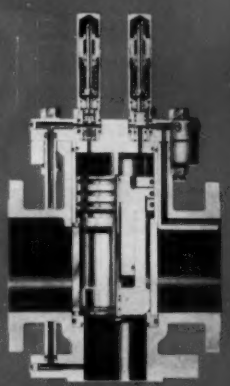

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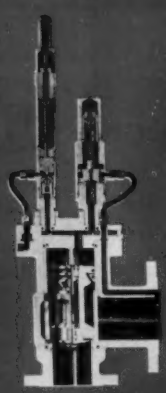

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Southern Natural to tap new reserves

An estimated $1.5 million will be spent by Southern Natural Gas Co. for construction in Louisiana (Docket 11234).

The Birmingham company plans to install about 10.5 miles of 8⅝-in. line, including a submarine crossing of the Mississippi; two measuring stations; two 660-hp compressor units at the Toca station, one 550-hp unit at the White Castle station, and one 1350-hp compressor at Gwinville.

With the new facilities, Southern Natural will avail itself of additional gas reserves from the Napoleonville field in Assumption parish and the Fort Jackson field in Plaquemines parish, both in Louisiana.

Rehearing on NGPL project denied

Rehearing of an FPC opinion authorizing Natural Gas Pipeline Co. of America to construct a 350-mile line has been denied by the commission (Docket 4280, et al.)

The line is designed to enable NGPL to tap reserves in northern Texas and southwestern Oklahoma and to purchase gas for transportation and ultimate delivery to the Chicago area. The FPC's opinion and order also issued a certificate to Lone Star Gas Co. authorizing it to sell a maximum of 100 MMcf/day to NGPL, although it denied Lone Star's proposal to build a 230-mile line to make this gas available to Natural at Fritch, Texas.

Applications for rehearing and stay were filed by Lone Star, Oklahoma Natural, and Consolidated Gas Utilities.

Panhandle, Trunkline decision modified

The FPC has affirmed but modified a presiding examiner's decision which approved three applicants and denied four others seeking gas service from Panhandle Eastern Pipe Line Co. and Trunkline Gas Co. (Dockets G-8471, et al.)

In his decision filed last year, Presiding Examiner Howell Purdue approved the applications of Franklin, Ill., which sought gas from Panhandle, and Hickman, Ky., and the Lake County Utility District, which sought gas from Trunkline. Denied were the applications of Clinton, La Center, Bardwell, and Wickliffe, Ky., all of which were seeking gas supplies from Trunkline.

Panhandle was directed to deliver up to 380 Mcf daily to Franklin, while Trunkline was to deliver maximum daily amounts of 1,082,000 cu ft to Hickman and 1.7 MMcf to Lake County. The FPC affirmed the allocations to Franklin and Hickman and increased to Lake County allotment to 2 MMcf.

To insure that no portion of the 2 MMcf allotted to the utility district will be used in large quantities for industrial purposes, the commission ordered that Trunkline not be obligated to deliver gas to the district for firm resale service to any industrial customers requiring more than 50 Mcf/day.

The commission, in an opinion issued June 30, 1956, found that all seven applicants had fallen short of making a showing that would justify the requested orders. However, the FPC gave the applicants a further opportunity to prove the economic and financial feasibility of their projects. In affirming the presiding examiner, the FPC re-

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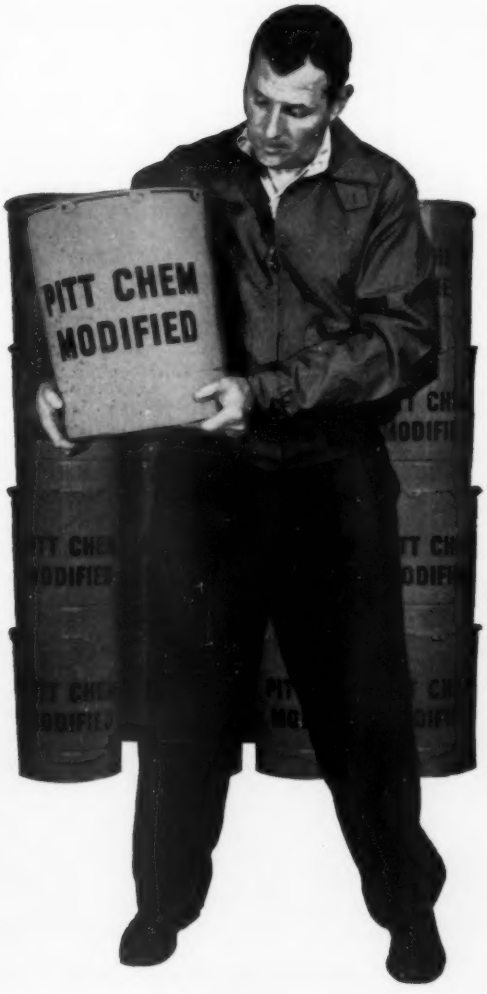

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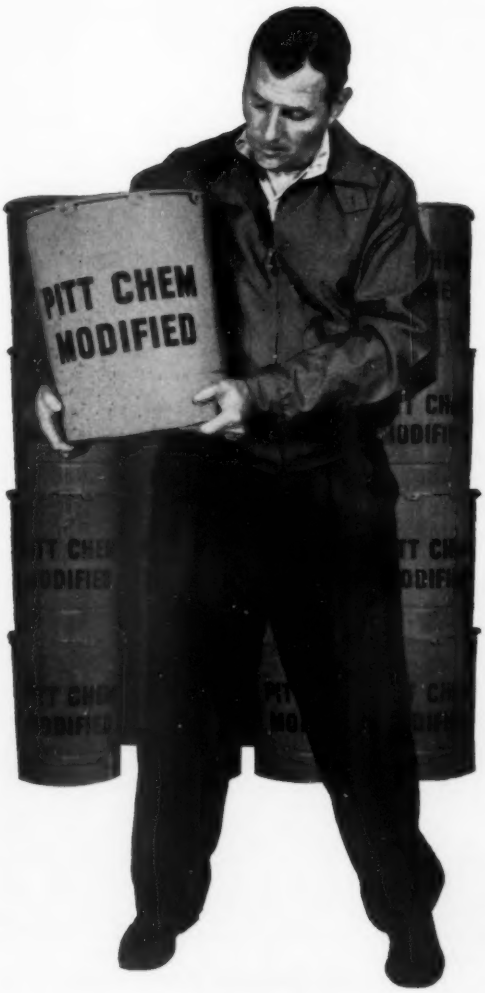

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opened the record again to permit the four remaining applicants to present further evidence in support of their respective projects.

Trunkline filed exceptions, which, among other things, opposed the continued reservation of gas to serve the applicants. The commission maintained the reservation since "all of Trunkline's gas is being sold to Panhandle, except that which will go to service Trunkline's other customer, and because the capacity of both Panhandle and Trunkline is large compared with the small amount, 1918 Mcf/day, to be reserved for the four cities . . ."

Transco's safety record receives acclaim

New safety records were set last year by the 1500 employees along the 1840 miles of the Texas-to-New York system of Transcontinental Gas Pipe Line Corp., according to President Tom Walker.

Notices of safety honors for 1956 were still coming in to the Houston office of Stanley Owens, Transco's director of safety. Already received were two national awards, and state awards from Texas, Alabama Pennsylvania and New Jersey.

The accident prevention award of the AGA recognized the 55 per cent reduction below the 1955 accident frequency rate. The 1956 record rate was 4.5 injuries per million man-hours worked. The other national award was the National Safety Council's Award of Merit for a "noteworthy performance over a three-year period."

From Alabama, Transco received three certificates of merit, one for each of the compressor stations in that state. The Department of Labor and Industry in Pennsylvania gave the company an award of honor for the perfect safety record at the Transco installation near Philadelphia. The New Jersey Department of Labor and Industry awarded Transco a certificate of merit for a perfect safety record in the annual statewide contest, and in Texas, the Texas Safety Association honored the transmission company for its "outstanding industrial safety achievement."

Price superintendents honored for safety work

Recognition of an outstanding record of safety and accident prevention in pipeline construction has been accorded to H. C. Price Co., Bartlesville, Okla., by the Pipe Line Contractors Association.

In making the announcement, Bennie G. Pierce, safety director of the pipeline constructors, revealed that of a total of nine safety awards presented to superintendents of association member companies, four of the top awards went to H. C. Price personnel—including first and second place honors.

Superintendents honored are R. L. Ezell, G. A. Reutzel, W. H. Olrich, and C. E. Shivel.

Mississippi River Fuel plans 50 MMcf expansion

Plans for a 10 per cent increase in natural gas deliveries to the St. Louis area by the 1958-59 heating season are being made by Mississippi River Fuel Corp. and Laclede Gas Co.

The increase will be accomplished by the installation of 125 miles of pipe along existing lines, together

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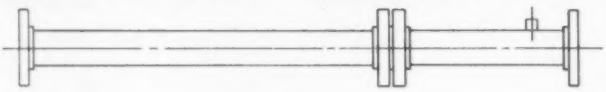
METERING EQUIPMENT*



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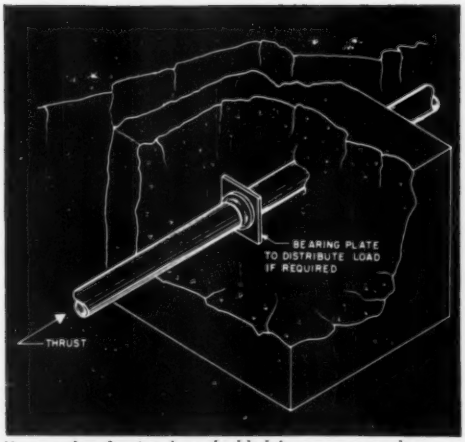
Close-up of TUBE-TURN Anchor Forging after butt-welding into 20" line.



How anchor forging is embedded in concrete and transmits pipeline thrusts to the structure.

Completed installation, showing reinforcing structure, ready for concrete.

Hold that line

with the new TUBE-TURN Welding Neck Anchor Forging*

Installing TUBE-TURN Anchor Forging in 20" gas line of Texas Gas Transmission Corp., near Eunice, La. Hubs are butt-welded to pipe ends.

High operating pressure, and expansion forces due to temperature change can team up to produce end thrusts in pipelines of 1,000,000 lbs. or more! Lines may be overstressed and expensive equipment damaged.

TUBE-TURN* Welding Neck Anchor Forgings provide an answer to this problem. Available for pipe sizes 6" through 36"... for operating pressures up to 1200 psig and temperature changes up to 90° F.

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with compressor equipment, sufficient to supply an additional 50 MMcf/day.

H. Reid Derrick, Laclede president, said that Mississippi's project should mean that an additional 10,000 to 12,000 domestic house-heating customers can be served in the area on the basis of Laclede getting about half of the additional gas supply.

Mississippi hopes to complete a substantial part of the $12 million program this year. The company has been having some difficulty in obtaining new gas reserves but is trying to overcome this problem by an exploration and drilling program in the coastal and offshore areas of Southern Louisiana.

Independents rate filings total $57 million

Approximately $57.4 million has been sought in rate increases by 4131 independent producers during their first 2½ years under FPC jurisdiction.

During the period June 7, 1954 and Dec. 31, 1956, the commission received 7738 certificate applications from independents and 5839 of these had been disposed of as of Dec. 31. During the year 1956 alone, producers filed 1255 certificate applications while the FPC disposed of 3601.

Since the Phillips decision, the commission suspended 427 increases amounting to $32,841,800 per year. During the same period, 3704 filings—totaling $24.6 million—were allowed without suspension.

Of the suspended increases, 69 totaling $7.1 million per year were disposed of by the end of 1956. The commission disallowed $3.8 million of this total, allowing approximately $3.2 million with $70,300 withdrawn. As of Dec. 31, there were 358 rate increases under suspension and still pending for $25.6 million per year.

Doubling of Super Inch to be completed this year

Double-barreling of the Super Inch is planned by Pacific Gas & Electric Co. by the end of this year. The San Francisco company has filed an application for that purpose with the California Public Utilities Commission.

Since the original 502-mile 34-incher started operating in 1950, PG&E has been adding paralleling sections between the line's southern end, on the Colorado river side of San Bernardino county, and its northern terminus near Milpitas in Santa Clara county.

Only 138 miles of single sections remain. The PUC already has authorized parallel lines for 64.5 miles. The remaining 73.5 miles, with compressor installations, represent an investment estimated at $9.3 million.

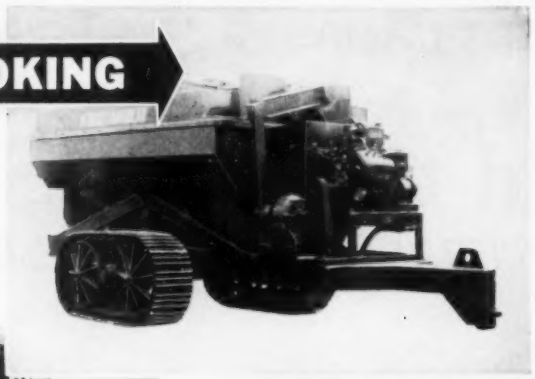
The double-barreled project will raise capacity to 950 MMcf, and the installation of more compressor capacity early in 1958 will increase deliveries to 1.25 billion cu ft per day.

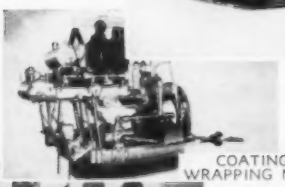
Court of Appeals upholds FPC in Am-La ruling

The U. S. Court of Appeals in Washington has denied appeals of two gas companies challenging an FPC order authorizing additional gas supplies for American Louisiana Pipeline Co.

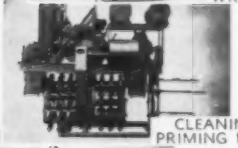
The FPC authorized the additional gas in May 1955. The suppliers are Superior Oil Co., Kerr-

NO COKING

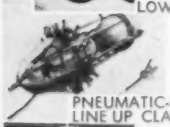


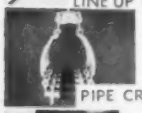

COATING AND WRAPPING MACHINES

PERRAULT-AMERICAN 25 BBL KETTLE


CLEANING AND PRIMING MACHINES

PNEUMATIC-TIRED LOWERING-IN CRADLE


PNEUMATIC-INSIDE LINE UP CLAMP


PIPE CRADLES

GLASS, ASBESTOS AND KRAFT WRAP

ROCK SHIELD

Agitator mat bars scrape entire kettle bottom every 3.35 seconds, allowing no material to remain on bottom long enough to burn, eliminating coking completely. Mat motion is slow enough so dope is not "whipped." Heavy mat will not float, scrapes bottom thoroughly.

OTHER FEATURES: Actual capacity is 25 bbl.-plus; Completely insulated; Melts dope fast; Drain valve inside kettle requires no pre-heating; Burner gravity-fed, no pump required; Fuel is diesel oil; Fuel tank capacity is 50 gals. Perrault-American 25 bbl. Kettles give contractors the most economical, rapid, maintenance-free-and-easy service. Other sizes available. For more information write or phone.

AND: PATCH POTS, BURNERS AND ACCESSORIES. TONGS, SLING BELTS, AND HOOKS, LINE-UP CLAMPS. HAND TOOLS. SUPPLIES AND EQUIPMENT OF EVERY SORT.

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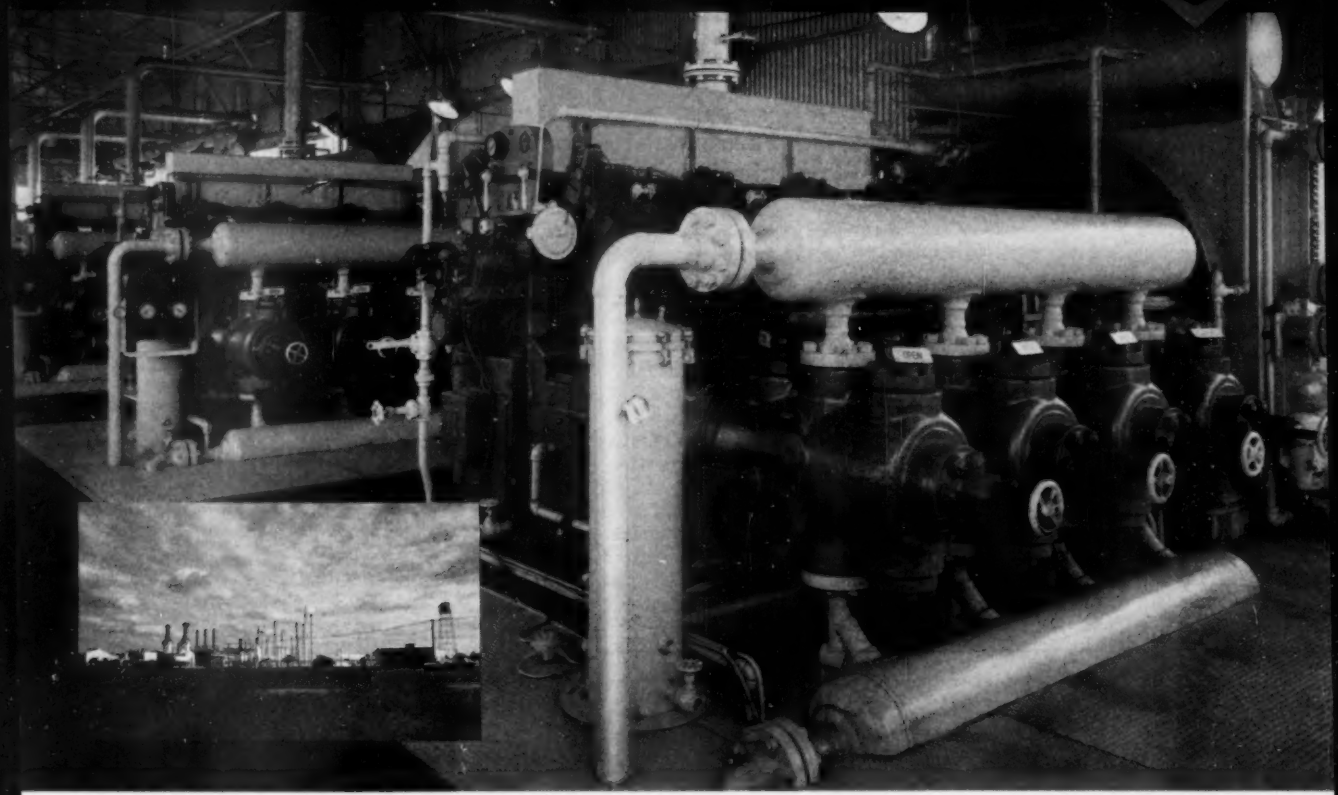
BEAIRD-INGERSOLL-RAND Packaged Compressor Plant



Arkansas Fuel Oil Corporation's Panola Gasoline plant equipped with three Beaird-Ingersoll-Rand 220 h.p. 8JVG packaged compressors. Units have Young radiators with lubricating oil coolers and gas after-coolers and all necessary controls for unattended operation. Other sizes 110 to 660 h.p.

Packaged Compressors provide—

FLEXIBLE OPERATION FOR LARGE GASOLINE PLANT

Arkansas Fuel Oil Corporation operates this large gasoline plant in the Panola Field just south of Carthage, Texas. Natural gas processed in the plant is picked up from 18 wells by three Beaird-Ingersoll-Rand 8JVG 220 h.p. packaged compressor units. Boosting 8 to 12 million cubic feet per day the units use one stage of compression to raise the gas from 550 psig input to 1100 psig.

To assure maximum flexibility and continuous operation, Arkansas Fuel Oil installed a number of packaged units rather than one large compressor of equal horsepower. Plant pressures and operations can be maintained, when necessary, by two of the units while the third is shut down for maintenance or repair. This permits plant production to be held to scheduled capacity at all times.

As wellhead pressures drop off the compressors can be changed on location to two-stage operation or additional units can be placed on the line. The operating flexibility of this multiple unit packaged compressor station will prove even more valuable as the field approaches depletion. When no longer needed the compressors can be transferred to other service as complete units with little or no change.

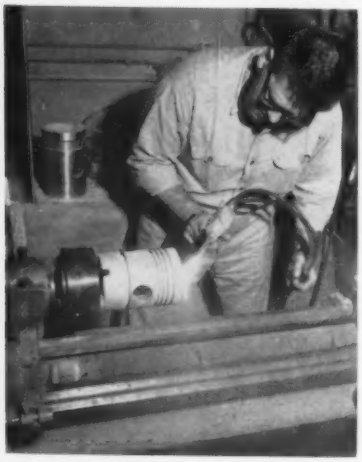
Let us show you how economically Beaird-Ingersoll-Rand packaged compressor plants can be added to your compressor station.

THE J. B. BEAIRD COMPANY, INC.
Shreveport, Louisiana

BEAIRD

LOWEST COST PER HORSEPOWER INSTALLED

SALES OFFICES: *Shreveport, New Orleans, Louisiana • Dallas, Houston, Corpus Christi and Midland, Texas • Tulsa, Oklahoma • Denver, Colorado • Los Angeles, California • Cie. Ingersoll-Rand, Paris, France • Caracas, Venezuela.*



Piston head of a diesel engine is sprayed with a protective "flame ceramics" coating by Kay R. Janush, assistant engineer at the Armour Research Foundation of Illinois Institute of Technology. This flame-sprayed zirconium oxide coating, developed at ARF, can withstand 4530°F.

McGee Oil Industries Inc., British American Oil Producing Co., and Stanolind Oil & Gas Co.

Panhandle Eastern Pipe Line Co. and the Memphis Light, Gas & Water division sought unsuccessfully to intervene in the commission proceedings and later took their objections to court. But the three-man appeals panel ruled unanimously that Panhandle and Memphis have no standing to object.

Panhandle must recompute principal and interest

Panhandle Eastern Pipe Line Co. has been directed by the FPC to recompute the principal and interest payments made to its wholesale customers as rate refunds covering the period from Feb. 20, 1952 through April 30, 1954. During this period a rate increase was in effect subject to refund of any excess charges.

The commission's action affirms with modification a decision issued last October by Presiding Examiner Edward B. Marsh. It requires Panhandle to compute each partial payment it has made as both principal and interest rather than as principal alone as the company had proposed.

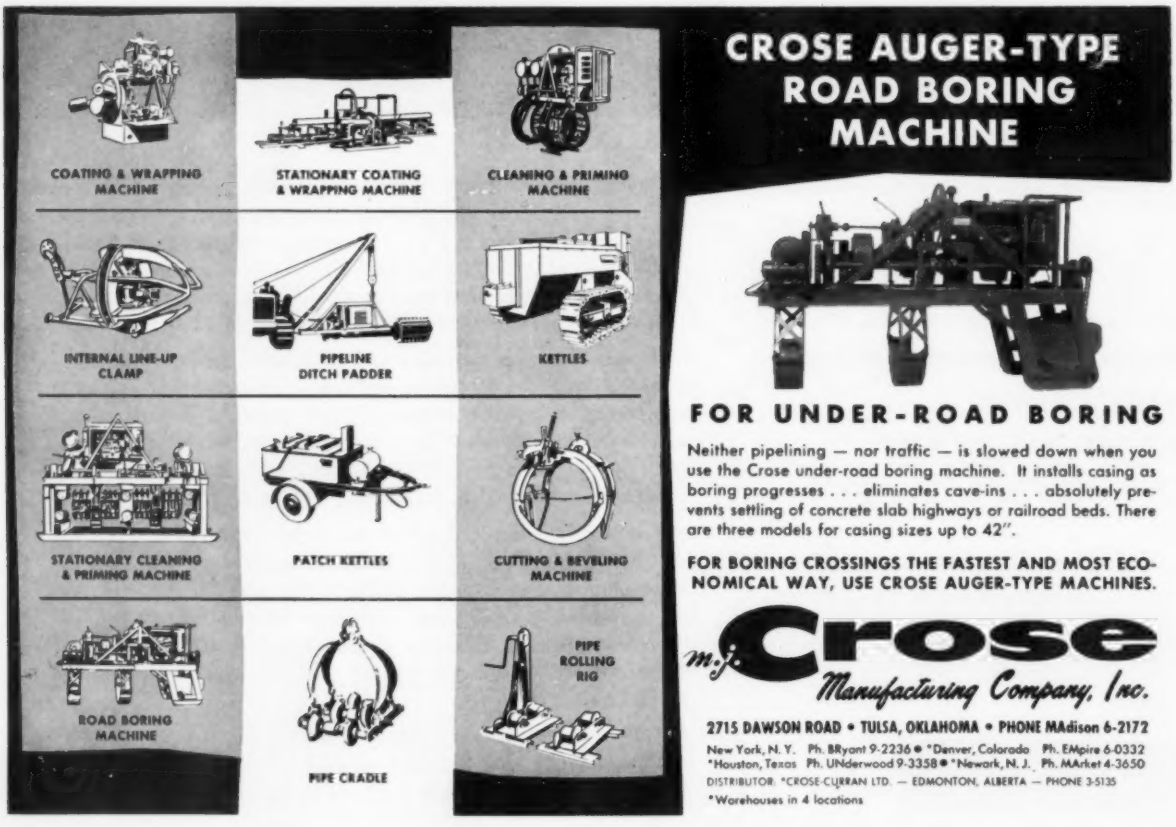
GAS pipeline notes

Manufacturers Light & Heat Co., Pittsburgh, has FPC authorization to construct a 5280-hp compressor station and other related facilities in Marshall county, W. Va., at a cost of $3.5 million. The new station will replace the existing 2500-hp station in Washington county, Pa.

Ledeen Manufacturing Co., El Monte, Calif., has appointed James E. Dyer Co., Tulsa, as representative for Oklahoma. Another new representative is Standard Equipment Sales, Seattle, covering western Washington.

Logistics Research has changed its name to Alwac Corp. Concurrent with the name change, the company occupied two new buildings totaling 70,000 sq ft in Hawthorne, Calif.

El Paso (Texas) Natural Gas Co. declared a regular quarterly dividend of 32½ cents a share on its common stock. The dividend, resulting from a two-for-one stock split effective last Dec. 27, was declared at a recent meeting of the board of directors of the company.


COATING & WRAPPING MACHINE
STATIONARY COATING & WRAPPING MACHINE
CLEANING & PRIMING MACHINE
INTERNAL LINE-UP CLAMP
PIPELINE DITCH PADDER
KETTLES
STATIONARY CLEANING & PRIMING MACHINE
PATCH KETTLES
CUTTING & BEVELING MACHINE
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PIPE CRADLE
PIPE ROLLING RIG
CROSE AUGER-TYPE ROAD BORING MACHINE
FOR UNDER-ROAD BORING
Neither pipelining — nor traffic — is slowed down when you use the Crose under-road boring machine. It installs casing as boring progresses . . . eliminates cave-ins . . . absolutely prevents settling of concrete slab highways or railroad beds. There are three models for casing sizes up to 42".
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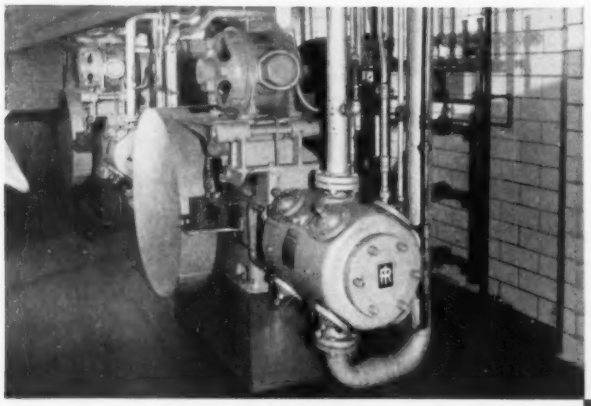
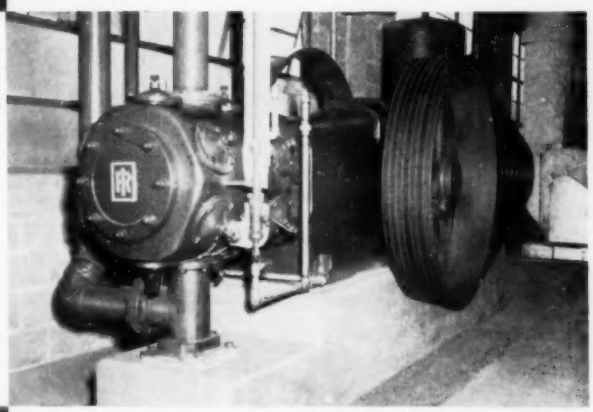


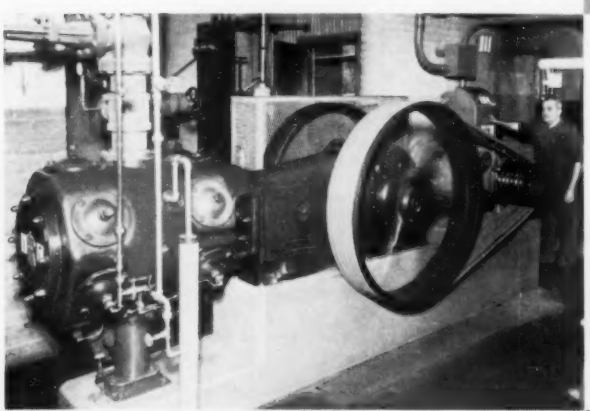
24 Hours a Day

These two Ingersoll-Rand ES compressors are on duty continuously, 24 hours-a-day—supplying instrument air for a large central station power plant. An uninterrupted air supply at constant pressure is essential to the proper functioning of automatic control instruments that have to stay on the job around the clock, month after month, year after year. The overhead motor mounting is but one of the many drive arrangements available.

20 Years of Service

Installed over 20 years ago, this Ingersoll-Rand ES compressor is still in excellent condition — still doing its job dependably, compressing air to 100 psi for general shop service in a large southern manufacturing plant. ES compressors of this age are a common sight in industrial plants all over the country — attesting to the tremendous stamina and long-life built into these heavy-duty machines.





No Forced Shutdowns

Here is one of six 75-hp ES compressors supplying low pressure air in a New England glass manufacturing plant. Since any interruption would result in costly damage to equipment and materials, this company uses dependable ES compressors to furnish a constant supply of process air. Here, as in many other applications, these trouble-free compressors have proven themselves, even under the most adverse conditions.

Ingersoll-Rand ES compressors are available in sizes from 5 to 125 horsepower and for pressures to 2500 psi and vacuums. Horizontal or overhead v-belt drive, direct-connected synchronous motor or steam drives are available. Ask your I-R representative for further details on the unit best adapted to your specific compression problem.

Only I-R compressors have CHANNEL VALVES

Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and leaf springs, with trapped-air spaces which cushion action.

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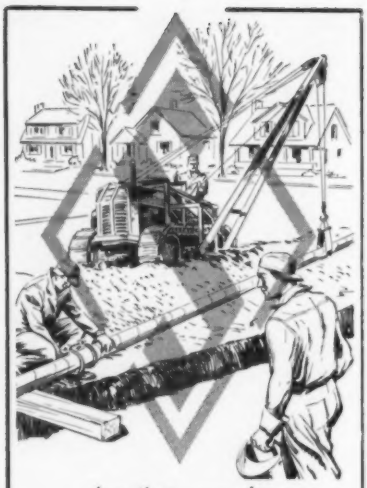

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GAS progress reports

NEW CONSTRUCTION PLANNED

EL PASO (TEXAS) NATURAL GAS CO. Docket G-11797 for field facilities including 224 miles of 20- to 10¾-in. line (176 miles of 20-in.); additional compression totaling 27,850 hp; and gasoline plants, dehydration plants, and additional gathering systems. Mainline facilities include 215 miles of loop ranging from 34- to 6⅝-in. and 58,500 hp additions. (Proposal supplements existing facilities and those authorized in Dockets G-8940 and 10499.)

SOUTHERN NATURAL GAS CO., Birmingham. Docket G-11234 for 10.5 miles of 10⅝-in. line, incldng submarine crossing of Mississippi river; two measuring stations; two in. line, including submarine crosing of Mis- 660-hp compressor units of Toca station; one 550-hp addition at White Castle station; and one 1350-hp unit at Gwinville.

TEXAS ILLINOIS NATURAL GAS PIPELINE CO., Chicago. Docket 11433 for 9.5 miles of 36-in. to loop single 30-incher from a point on the north bank of the Illinois river to the Joliet regulator station.

TRANSCONTINENTAL GAS PIPE LINE CORP., Houston. To build seven new mainline compressor stations in Louisiana, Mississippi, Alabama, Georgia, North Carolina, and two in Virginia. Additional compressor engines will be installed in 9 existing stations. Includes 229 miles of gathering laterals in Texas to bring in new reserves; 5 new gathering meter stations and five dehydration stations are planned. Also includes 42 additional miles of 36-in. and 16 miles of 30-in. loop.

CURRENT CONSTRUCTION

ALBERTA GAS TRUNK LINE CO. LTD., to build 550-mile gathering line in Alberta. 1956 construction consisted of Red Deer river crossing near Bindloss.

EL PASO (TEXAS) NATURAL GAS CO. Docket G-10481 to install 28.1 miles of 10¾-in. line in Nolan and Coke Counties, Texas; install new 1320-hp compressor station at Jameson. Line completed. Work underway on compressor.

EL PASO (TEXAS) NATURAL GAS CO. Docket G-8940. To build 338-mile, 34-in. loop line from San Juan basin to a point on California - Arizona border near Topock, Ariz., to increase supplies to existing customers. Completion scheduled for April.

KANSAS-NEBRASKA NATURAL GAS CO., Hastings, Neb. Docket G-10014. The 2700-hp additions at five compressor stations have been completed. 32.7 miles of line to get under way this month by Brodie Construction Co. Works calls for 11.5 miles of 12-in., 10 miles of 10-in., 10 miles of 8-in., with 1.2 miles of 6-in. already completed.

MICHIGAN WISCONSIN PIPE LINE CO., Detroit. Docket G-2327 15.5 miles of 4- and 6-in. line to Three Rivers, Mich. under construction; 25 miles of 24-in. in Wisconsin and 18.5 miles of 4-in. in Iowa, Illinois, Wisconsin and Michigan authorized and scheduled for completion this year. All other construction under this docket has been completed and is in operation.

MONTANA-DAKOTA UTILITIES CO., Minneapolis. Docket G-10521. Remaining compressors (two 540-hp at Baker, Mont.) scheduled for installation next summer.

MOUNTAIN FUEL SUPPLY CO., Salt Lake City. Dockets G-10426 and 10446. To build 38 miles of 20-in line and compressors to transport from Sweetwater county in southern Wyoming 60 MMcf/day purchased from Pacific Northwest Pipeline Corp. Also 2640 hp addition at existing compressor station. 5 miles line and compressors completed. Balance pending.

NORTHERN NATURAL GAS CO., Omaha. Dockets G-2399, et al, for 654 miles of line and an additional 12,640 hp in compressor capacity. Also 15-mile 24-in. line from Ogden, Iowa to underground storage near Redfield; 168-mile 20-in. from Twin City area to Duluth and Superior; 92-mile 12-in. and 71-mile 10-in. line in South Dakota and 307 mile of branch lines. Compressor additions and 15-mile line to test Redfield storage project approved. Contracts for compressors and line let to H. B. Zachary, Dresser Engineering Co., Foor Engineering Co., R. H. Fulton & Co., and Pentzien Inc. Newly approved portion includes a total of 354 miles of line and 18,640 hp in com-

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CONCRETE RIVER WEIGHTS

One of the many Edwards Concrete River Weights installations on Texas-Illinois Natural Gas Pipeline.
Edwards Split Welding Sleeves also used on the line to insure perfect joints in swamps, rivers and safety zones.

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pressor capacity broken down as follows: 163-miles extension from Sioux Falls, S. D. area to Aberdeen, S. D. plus 160 miles of branch lines in South Dakota. Not approved is the Duluth-Superior extension.

PACIFIC GAS & ELECTRIC CO., San Francisco. For 83-mile 20-, 18-, and 16-in. line from Beehive Bend field near Willows, Calif., to a point near Davis and then east into Sacramento. About 53 per cent complete.

PACIFIC GAS & ELECTRIC CO., San Francisco. Construction work on 85-mile, 34-in. line paralleling Super Inch from Topock, Ariz. to Milpitas, Calif. New 3500-hp compresor at Topock installed and on test. Compressor conversions underway at Kettleman and minor work, including scrubber installation at Hinckley, is nearing completion.

PERMIAN BASIN PIPELINE Co., Omaha. Dockets G-9688 and 9724. For 19-mile, 16-in. line and 6750-hp compressor station in Andrews county, Texas, to take gas from Phillips gasoline plant. Gasoline Plant Construction Corp. Houston building compressor station; R. H. Fulton the line.

SOUTHERN CALIFORNIA and SOUTHERN COUNTIES GAS CO., Los Angeles. A 241-mile 30-in. lone from Newal, Calif. to Colorado river near Needles to meet El Paso Natural line from San Juan and Permian basins. R. H. Fulton & Co., Lubbock, Texas, started construction in January. Completion scheduled for June 1957. Four 2000-hp compressors will be installed at new station near Needles. Schedule to begin operation in November.

TEXAS EASTERN TRANSMISSION CORP., Shreveport. Dockets G-2503, 9784-87. 422 miles of 30-in. line near Mexican border to transport gas to Texas Eastern's Vidor, Texas station; approximately 45 miles of 24-in. pipe connecting TET's existing line near Provident City, Texas, to the new line; pipeline loops totaling about 77 miles at various locations along existing 30-in. system; approximately 147 miles of supply and sales laterals; new and additional compression facilities totaling 32,250 hp; and approximately 20 sales measuring and regulating stations.

TRANS-CANADA PIPE LINES LTD., for 2287-mile gas line taking Alberta gas from Alberta - Saskatchewan border to Toronto and Montreal, with lateral from Winnipeg to Emerson, Man., 34-in. line from Alberta border to Winnipeg under construction. 30-in. from Winnipeg to Toronto; 24- and 20-in. from Toronto to Montreal; 24-in. from Winnipeg to Emerson; 10 compressor stations totaling 105,000 hp. First four sections of line under contract to Majestic Contractors Ltd., Mannix Ltd., Canadian Bechtel Ltd., and Dutton-Williams Brothers. By November, 230 miles of 34-in. had been ditched.

WASHINGTON (D.C.) GAS LIGHT CO. Docket G-10090 for 26.1-mile, 24-in. line from Dranesville, Va. to a point near Washington. Work nearly completed.

WESTCOAST TRANSMISSION CO. LTD., Calgary. To build 650-mile, 30-in. line from Peace river area to near Vancouver, B. C., to connect with line of Pacific Northwest Pipeline Corp., to transport 400 MMcf daily, of which 300 MMcf is to be delivered to PNW. 400 miles of line installed and ready for testing. Scheduled for completion in fall of 1957.

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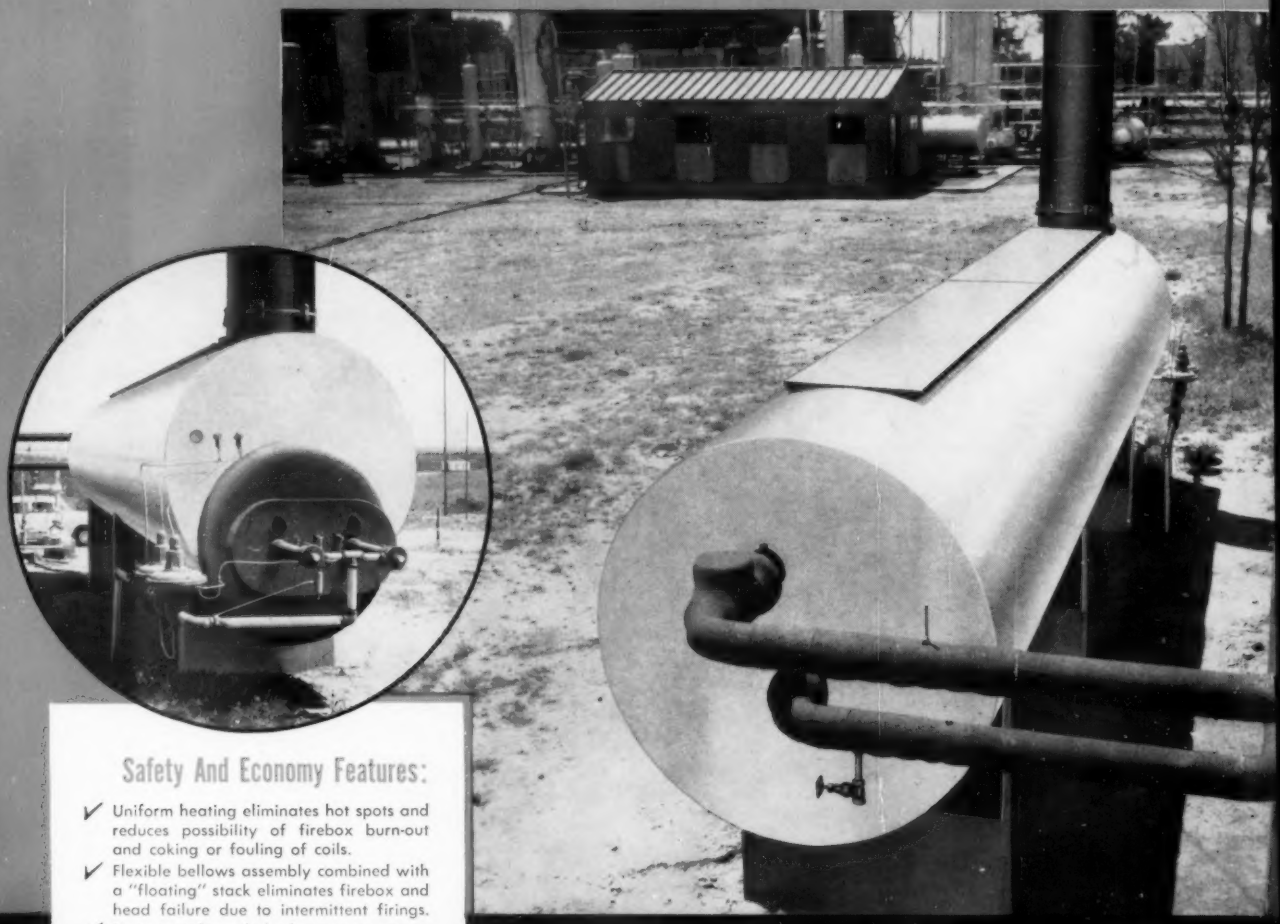

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- ✓ Uniform heating eliminates hot spots and reduces possibility of firebox burn-out and coking or fouling of coils.
- ✓ Flexible bellows assembly combined with a "floating" stack eliminates firebox and head failure due to intermittent firings.
- ✓ Heat transfer salt bath operates at atmospheric pressure, and therefore cannot cause vessel rupture.
- ✓ Molten salt is non-corrosive to carbon steel, non-volatile, thermally stable and non-toxic.
- ✓ Ample space for the salt has been provided to prevent "boiling over". Salt requirements have been minimized for greater economy.
- ✓ Reliable BS&B heater controls with dual temperature controls are standard equipment. BS&B pilot light permits either snap-acting or throttling burner controls with minimum possibility of pilot failure.

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